16-521-101
JULY 1983

FIREPOWER II

SERVICE MANUAL

CONTENTS

CHAPTER 1 Game Setup

Warnings & Notices

Installation

Inspection

Power Turn-On

Location of Controls

Warnings & Notices

WARNING:

1. **FOR SAFETY AND RELIABILITY, WILLIAMS** does not recommend or authorize any substitute parts or modifications of WILLIAMS equipment.
2. **USE OF NON-WILLIAMS PARTS** and modifications of game circuitry may adversely affect game play, or may cause injuries.
3. **SUBSTITUTE PARTS, MODIFICATIONS AND GAME "CONVERSIONS"** may void FCC type-acceptance.
4. **SINCE THIS GAME IS PROTECTED** by Federal copyright, trademark and patent laws, so-called game "conversions" may be illegal under Federal law.
5. **THIS "CONVERSION" PRINCIPLE ALSO APPLIES** to unauthorized facsimiles of WILLIAMS equipment, logos, designs, publications, assemblies and games (or game features not deemed to be in the public domain), whether manufactured with WILLIAMS components or not.

RF INTERFERENCE NOTICE:

CABLE HARNESS PLACEMENTS AND GROUND STRAP ROUTING on this game have been designed to keep RF radiation and conduction within levels accepted by FCC regulations.

TO MAINTAIN THESE LEVELS, reposition harnesses anc reconnect ground straps to their original placements if they should be disconnected during maintenance.

Installation

With legs attached to cabinet, proceed as follows:

1. Unlock and remove backglass from backbox.
2. Remove shipping insert and shipping blocks from insert door.
3. Unlatch and open insert door.
4. Unlatch speaker panel, disconnect speaker cable, and remove speaker panel. Close and latch insert door.
5. Reach into the cabinet pedestal hole and pull up the line cord. Insert the line cord into the notch in thecabinet pedestal. DO NOT PLUG IN AT THIS TIME.
6. Position backbox face-down on top of cabinet with neck opening facing rear of cabinet.
7. Pull five cable connectors from backbox.
8. Reach into pedestal hole of cabinet, pull up ground strap braid wire, and push it into backbox.
9. Remove ties securing cabinet and playfield cables and pull these cables up through pedestal hole.
10. Interconnect cabinet and playfield cables with those of backbox. All are shape, size and color-coded:

    General Illumination Connector: 6-Pin WHITE
    Switch Connector: 15-Pin WHITE
    Lamp Connector: 24-Pin WHITE
    Solenoid Connector: 36-Pin BLACK
    Cabinet Connector: 36-Pin WHITE

11. Push Remote Volume Control Cable (GRAY), terminated in a 4-Pin connector, and Transformer Secondary Harness, terminated in four connectors: 2-Pin WHITE, 6-Pin BLUE, 9-Pin WHITE, and 12-Pin WHITE into backbox.
12. Lift up backbox and position on cabinet pedestal, engaging brackets for support.
13. Secure backbox to cabinet using two bolts and related washers.
14. Connect ground braid, and WHITE-RED wire under wing nut and washer at bottom of backbox.
15. Guide Remote Volume Control Harness through harness clips on back of backbox and connect 4 Pin connector to Sound Board 10J4.
16. Connect Transformer Secondary cable connectors:

    6-Pin BLUE (7 wires) to 6-Pin WHITE (7 wires)
    12-Pin WHITE to Power Supply 3J1
    2-Pin WHITE to Power Supply 3J9
    9-Pin WHITE to Sound Board 10J1

Inspection

A. Check all connectors in backbox for loose wire termination. Reseat any loose wires by pushing in on terminal.

B. Push on all connectors attached to Master Display, CPU, Driver, and Sound Boards, and check terminations on capacitor and bridge rectifiers at lower right of backbox.

C. Gently press on all socketed IC packages on CPU and Sound Boards.

D. Check that two fuses on Sound Board and seven fuses on Power Supply Board are secure.

E. Push on connector attached to Slave Display Boards.

F. Check that line fuse in bottom of cabinet is secure.

G. Check transformer input connector in bottom of cabinet for loose wire termination. Reseat any loose wires by pushing in on termination.

H. Check cabinet to coin door connector for loose wire termination. Reseat any loose wires by pushing in on termination.

Power Turn-On and Game Setup

This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD and to ensure PROPER GAME OPERATION. DO NOT use a "cheater" plug to defeat the ground pin on line cord, and DO NOT cut off ground pin. Line voltage MUST agree with that specified on the back of cabinet or serious damage to machine could occur. For low-line applications (105 or 210V ac), refer to the power wiring diagram.

A. With the coin door closed, plug game in and turn it ON. Game should come on in Game Over mode as indicated by Player 1 score reading zero, Game Over lights lit, and High Score to Date alternating with player scores.

B. If game comes on in the Diagnostic Mode (Credits display showing 04, Ball in Play Display showing 00, and Player 1 display showing game identification) turn game OFF and ON again.

   1. If game now comes on in Game Over mode, bookkeeping and game evaluation totals have been reset to zero.

   2. If game still comes on in Diagnostic Mode, open coin door and turn game OFF, and ON twice. This is an indication of batteries being removed with power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings. Any changes from factory settings must be re-entered using procedures provided in Instruction booklet.

C. If game still comes on in Diagnostic Mode, CPU board or memory-protect circuit may have failed.

D. Place three balls on playfield next to outhole.

E. Perform diagnostic tests and make any desired changes to features as described in Instruction booklet.

Location of Controls

ON-OFF SWITCH—On bottom of cabinet in the area of the right front leg as you face the game.

VOLUME CONTROL—Accessible through coin door on left cabinet wall.

DIAGNOSTIC SWITCHES—Advance, AUTO-UP/MANUAL-DOWN, and high score reset switches are located on back of coin door. Refer to diagnostic and adjustment procedures for operation.

MEMORY PROTECT SWITCH—Must be open to clear bookkeeping and make game adjustments. Located on inside of coin door frame and automatically opens when coin door opens.

CPU DIAGNOSTIC SWITCH—Operates board self test explained in diagnostic procedures. Located on left edge of CPU board.

SOUND BOARD DIAGNOSTIC SWITCH—On top edge of sound board and used to initiate sound board self test. Refer to diagnostic procedures.

SOUND SPEECH MIXER CONTROL—Used in games with speech to balance level of synthesised sound and speech. Located on speech module.

CHAPTER 2 Game Operation

Game Operation

Game Over Mode—Turn game ON; player 1 score shows 00; all player scores alternate the high score to date, Game Over lamp lights. All playfield lamps cycle in attract mode.

Credit Posting—Insert coins; sound produced, number of credits displayed. If maximum credits* exceeded by coin or high score to date, credits posted correctly and coin lockout de-energizes until remaining credits are below maximum. No credits may be won and coins are rejected while the coin lockout is de-energized.

Game Start—Push credit button; start-up tune played, ball served, credit display reduced by one player 1 up flashes until first scoring switch is made, ball in play shows 1. Pushing credit button before ball 2 is displayed allows additional players.

Bonus—Bonus is advanced (from 1,000 to 99,000) once by making A-B-C-D lanes, and for F-I-R-E-P-O-W-E-R targets when not lit, and three times for flipper return lanes when lit. Completing orbit shot scores 5,000 and three advances, or 10,000 and ten advances when lit for bonus holdover. Lighting A-B-C-D advances bonus multipliers (2x, 3x and 5x), and scores 25,000 points with 5x lit. Operating right flipper (Lane Change feature) alternates lit lanes.

Orbit Shot—Entering spinner lane and exiting orbit out gate completes orbit shot. Lighting F-I-R, E-P-O, or W-E-R lights individual jet bumpers for 1,000 points and Orbit Shot* arrow for ten seconds to award bonus holdover. Completing Orbit with bonus holdover arrow lit awards bonus memory for next ball. If bonus holdover has been awarded, Orbit scores 25,000 points.

F-I-R-E-P-O-W-E-R—Completing F-I-R-E-P-O-W-E-R:

- **Lights one flipper return lane and spinner the first time**
- **Lights other flipper return lane the second time**
- **Lights Ramp Shot for Extra Ball the third time**
- **Lights FIREPOWER and one drain Special the fourth time**
- **Awards FIREPOWER special the fifth time**
- **Scores 50,000 points the sixth and succeeding times**

Drain Specials will alternate by hitting kickers.

Ramp Shot—Completing Ramp Shot scores 5,000 or lit value (mystery or extra ball). Making right flipper return lane when lit lights ramp shot for Mystery value* (20,000 to99,000) for seven seconds.

Multi-Ball—Making eject hole* scores 5,000 or lit value, and advances lit value, locks ball, and another ball is put into play. Hitting release target* scores 25,000 or lit value, advances lit value, and initiates two ball Multi-Ball. All scoring during Multi-Ball doubles except for the eject hole which scores 5,000 and ejects ball.

End of Game—If bonus holdover is lit at end of last ball the bonus and multipliers will score. Then same amount of bonus will score without multipliers to award bonus holdover. Match Digits* appear in ball in play display, credit* awarded for match. Exceeding High Score to Date awards three* credits. Match, High Score to Date, and Game Over sound made as appropriate.

Bookkeeping and Game Evaluation

(Functions 01-17)

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in the credits display, Function 00 in Match display, and Game Identification in Player 1 display.
2. Operate the ADVANCE pushbutton to display Functions 01 thru 04 on the Match display (See Table 1) and record the corresponding totals (number of coins and total paid credits) from the Player 1 display. (To review a total that has been advanced past, set switch to MANUAL-DOWN and operate the ADVANCE pushbutton).
3. Operate the ADVANCE pushbutton to display Functions 05, 06, and 07 in the Match display and record the corresponding free credit totals from the Player 1 display.
4. Operate the ADVANCE pushbutton to display Function 08 in the Match display. Total credits is indicated in the Player 1 display, total free credits in the Player 2 display, and percentage of free credits in the Player 4 display.
5. Operate the ADVANCE pushbutton to display Function 09 thru 12 in the Match display and record the corresponding totals from the Player 1 display.

*Indicates game program adjustable features.

6. Operate the ADVANCE pushbutton to display Functions 13 thru 17 in the Match display and record the corresponding totals from the Player 2 display.

7. With switch set to MANUAL-DOWN operate ADVANCE to display Function 50 in the Match Display. From Function 50 you can return to game over or zero audit totals and return to game over. Perform step 8.a. or 8.b. as desired.

8. a. To return to game over, set the switch to AUTO-UP and depress ADVANCE.
   b. **To zero audit totals** and return to game over set switch to AUTO-UP, operate the credit button to display 35 in the Player 1 display, and depress ADVANCE.

RESETTING HIGH SCORE TO DATE

1. Using game adjustment procedure, set Function 13 to the desired reset value.
2. Depress HIGH SCORE RESET pushbutton.

FACTORY AUDIT TOTALS

(Functions 42-49)

The factory audit functions are not assigned.

Table 1. Audit Totals

FUNCTION	DESCRIPTION	
	PLAYER 1	PLAYER 2
00	Game Identification (2521 1)	—
01	Coins, Left chute (closest to coin door hinge)	—
02	Coin, center chute	—
03	Coin, right chute	—
04	Total Paid Credits	—
05	Special Credits	—
06	Replay Score Credits	—
07	Match Credits	—
08	Total Credits	Free Credits
09	Total Extra Balls	—
10	Ball Time in Minutes	—
11	Total Balls Played	—
12	Current High Score to Date	—
13	Backup High Score to Date	High Score to Date Credits Awarded
14	Extra Ball 1 Score	Times exceeded
15	Extra Ball 2 Score	Times exceeded
16	Extra Ball 3 Score	Times exceeded
17	Extra Ball 4 Score	Times exceeded

Game Adjustment Procedure

(Functions 13-41)

Coin door must be open to change settings.

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress the ADVANCE pushbutton. Test 04 is indicated in the Credits display, Function 00 in Match display, and game identification in Player 1 display.
2. **To raise** Function number in Match display, operate ADVANCE pushbutton with switch set to AUTO-UP. **To lower** Function number, operate ADVANCE with switch set to MANUAL-DOWN.
3. With desired Function indicated in Match display, **raise** value in player 1 display by operating credit button with switch set to AUTO-UP; **lower** value by operating credit button with switch set to MANUAL-DOWN. Value left in Player 1 display is the new setting. For values see Table 2, and for pricing Table 3.
4. Repeat steps 2 and 3 until all required adjustments have been made.
5. Operate ADVANCE until Function 50 is indicated in Match display. From Function 50 you can return to game over or **restore factory settings**. Perform step 6 or 7 as desired.
6. To return to game over, depress ADVANCE with switch set to AUTO-UP.
7. To restore factory settings **and** zero audit totals:
   a. Operate Credit button with switch set to AUTO-UP until 45 is indicated in Player 1 Display.
   b. Depress ADVANCE. The game returns to Test 04, Function 00.
   c. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50.
   d. Set switch to AUTO-UP and depress ADVANCE.

Table 2. Game Adjustments

FUNCTION	DESCRIPTION	NOTES	*FACTORY SETTING
13	Backup High Score to Date (HSTD Credits Awarded)	1	2,500,000
14	Replay 1 Score (Times exceeded)	2	800,000
15	Replay 2 Score (Times exceeded)	2	1,500,000
16	Replay 3 Score (Times exceeded)	2	0
17	Replay 4 Score (Times exceeded)	2	0
18	Maximum Credits	3	30
19	Standard and Custom Pricing Control	4	01/02
20	Left Coin Slot Multiplier	4	09/09
21	Center Coin Slot Multiplier	4	04/45
22	Right Coin Slot Multiplier	4	01/18
23	Coin Units Required for Credit	4	02/05
24	Coin Units Bonus Point	4	04/45
25	Minimum Coin Units	4	00
26	Match: 00 = Match ON; 01 = Match OFF	—	00
27	Special: 00 = Awards Credit; 01 = No Special; 02 = Awards Points	—	00
28	Replay Scores: 00 = Awards Credit; 01 = Awards Extra Ball	—	00
29	Maximum Plumb Bob Tilts	—	00
30	Number of Balls (03 or 05)	—	03
31	Eject and Release Values: 00 = 1st Lamp not Lit initially; 01 = 1st Lamp Lit initially	—	01
32	Mysterytime: 00 = 5 seconds; 01 = 7 seconds	—	01
33	Holdovertime: 00 = 7 seconds; 01 = 10 seconds		01
34	Extra ball memory: 00 = No memory; 01 = Memory		01
35	Background sound: 00 = Background ON; 01 = Background OFF		00
36-39	Not Used	—	00
40	High Score Credits	1	03
41	Maximum Extra Balls at one time (00 = No Extra Ball)	—	07

NOTES:
*Second Factory Setting value is with jumper W25 on CPU Board connected.
[ ] Description in brackets shown in Player 2 Display.
1. Function 13 may be set to any mulitiple of 100,000 points. Setting Function 40 zero with Function 13 set to any score but zero permits the High Score to Date feature to operate but no credits are awarded.
2. Functions 14-17 (Replay Scores) may be set to any multiple of 100,000 points. Setting a function to zero disables the replay score point.
3. Setting Maximum Credits (Function 18) to zero places the game in a free play mode.
4. With Function 19 set to 00, Functions 20-25 must be set manually. Refer to Table 2 for eight standard pricing schemes (selected by values of 01-08 for Function 19) and custom pricing values. For Straight quarter play, set Function 19 to 00, Function 23 to 01 and Function 24 to 00. All other pricing functions should remain at their factory settings.

Table 3. Standard and Custom Price Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION						
		19	**20**	**21**	**22**	**23**	**24**	**25**
Twin-Quarter Quarter, Dollar, Quarter	1/25¢, 3/50¢, 7/$1	00	03	12	03	02	12	00
	1/25¢, 3/50¢, 7/$1 coin only	00	03	14	03	02	00	00
	1/25¢, 7/$1 coin only	00	01	07	01	01	00	00
	1/25¢, 3/50¢, 6/$1	00	01	04	01	01	02	00
	1/25¢, 6/$1 coin only	00	01	06	01	01	00	00
	1/25¢, 5/$1	00	01	04	01	01	04	00
	2/50¢, 5/$1	00	01	04	01	01	04	02
	1/25¢, 5/$1 coin only	00	01	05	01	01	00	00
	•1/25¢, 4/$1	**01**	**01**	**04**	**01**	**01**	**00**	**00**
	2/50¢, 4/$1	00	01	04	01	01	00	02
	•1/50¢, 2/75¢, 3/4 x 25¢ 4/$1 or 5 x 25¢	**05**	**03**	**15**	**03**	**04**	**15**	**00**
	1/50¢, 3/$1, 4/$1.25	00	03	12	03	04	15	00
	1/50¢, 3/$1, 7/$2	00	12	48	12	14	96	18
	•1/50¢, 3/$1, 6/$2	**03**	**01**	**04**	**01**	**02**	**04**	**00**
	1/50¢	00	01	04	01	02	00	00
1DM, 5DM, 2DM	**•1/1DM, 3/2DM, 10/5DM**	**02**	**09**	**45**	**18**	**05**	**45**	**00**
	2/1DM, 5/2DM, 14/5DM	00	13	65	26	05	65	00
20-Cent, 50-Cent	1/20¢, 3/50¢	00	06	00	15	05	00	00
1 Franc, 10 Franc, 5 Franc	**•1/2F, 3/5F only, 8/10F only**	**04**	**01**	**16**	**06**	**02**	**00**	**00**
25 Cent, 1 Guilder,	**•1/25¢, 4/1G**	**06**	**01**	**00**	**04**	**01**	**00**	**00**
	1/25¢, 5/1G	00	01	00	04	01	04	00
Twin 100 Yen	2/100Y	00	02	00	02	01	00	00
1 Franc or Twin-1 Franc	1/1F, 3/2F	00	01	01	01	01	02	00
	1/1F	00	01	01	01	01	00	00
5 Franc, 10 Franc	**•1/5F, 2/10F**	**07**	**01**	**00**	**02**	**01**	**00**	**00**
	•1/10F	**08**	**01**	**00**	**02**	**02**	**00**	**00**
Twin-2 Franc	**•1/2F**	**03**	**01**	**04**	**01**	**01**	**00**	**00**
10, 20 Franc	**•1/10F, 2/20F**	**07**	**01**	**00**	**02**	**01**	**00**	**00**
Twin-1 Sucre	1/3S, 2/5S	00	02	00	02	05	00	00

•Indicates standard price settings by adjusting **only** Function 19. For other price settings, set Function 19 to 00 and set Functions 20 through 25 to the values indicated in the chart.

CHAPTER 3 Diagnostic Procedures

ROM SUMMARY

ROM	PART NO.	DESCRIPTION	BOARD	LOCATION
Game ROM 0	A-5343-10350	ROM, 4Kx8, REV 1 (Blue)	CPU	IC26
Game ROM 1	A-5343-10349	ROM, 4Kx8, REV 1 (Blue)	CPU	IC14
Flipper ROM 2	A-5343-09553	ROM, 4Kx8, REV 1 (Blue)	CPU	IC20
Flipper ROM 2	A-5341-09554	ROM, 4Kx8, REV 1 (Blue)	CPU	IC17
Sound ROM 3	A-5343-04970	ROM, 2Kx8 (White)	Sound	IC12

Special Considerations When Replacing Circuit Boards

CPU BOARD

1. Revision level 7 CPU Boards (batteries located on lower left corner at board) of later boards must be used.
2. Must be equipped with blue-labeled Flipper ROMs and Game ROMs.
3. Jumpers W3, W10, W11, W14, W17, W19, W20, and W22 must be connected. Jumpers W4, W9, W12, W15, W16, W18, W21, and W23 must be removed. With the exception of W25, (Factory Setting Jumper) all other jumpers are not changed.

DRIVER BOARD

Must be equipped with zero-ohm resistors or wire jumpers (W9-W16) in place of switch matrix drive series resistors R204-R211.

SOUND BOARD

Must be jumpered for ROM operation and be equipped with Sound ROM 13. (Jumpers W2, W5, W7, W9, W10, W12, and W15 connected; W3, W4, W6, W8, W11, and W13 removed).

POWER SUPPLY BOARD

1. Model D 8345 board required (equipped with relay).
2. Fuse F4 (10A SB) for flipper solenoids must be installed.

DISPLAY BOARDS

Model C 8363 Master Display and 7-digit Slave Displays required.

Diagnostic Procedures

DISPLAY DIGITS TEST

1. Set AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN and depress ADVANCE. Displays should indicate all 0's.

2. Set the switch to AUTO-UP. Displays should sequence from all 0's thru all 9's. Comma segments should come on when odd digits are displayed.

3. To stop cycling, set switch to MANUAL-DOWN. Operate ADVANCE pushbutton to step through the tests one number at a time. Set switch to AUTO-UP to resume cycling.

SOUND TEST

1. From Display Digits Test depress ADVANCE with the switch set to AUTO-UP. Test 00 should be indicated in the Credits display and the Match display should sequence from 00 thru 06. Different sounds should be produced for 00, 01, 02, 03, and 04.

2. To continuously pulse a single sound, set the toggle switch to MANUAL-DOWN. Operate ADVANCE push-button to sequence through sounds one at a time. Set toggle switch to AUTO-UP to resume sequencing.

LAMP TEST

From Sound Test depress ADVANCE with the switch set to AUTO-UP. Test 01 should be indicated in the Credits display and all multiplexed lamps should flash.

COLUMN / ROW	1 YEL-BRN 2J5-8	2 YEL-RED 2J5-9	3 YEL-ORN 2J5-6	4 YEL-BLK 2J5-7	5 YEL-GRN 2J5-3	6 YEL-BLU 2J5-5	7 YEL-VIO 2J5-1	8 YEL-GRY 2J5-2
1 RED-BRN 2J7-1	Game Over 1	1,000 Bonus 9	9,000 Bonus 17	"F" 25	"R" 33	Lower Left Jet Bumper 41	2x 49	Release Target 100K 57
2 RED-BLK 2J7-2	Match 2	2,000 Bonus 10	10,000 Bonus 18	"I" 26	"A" 34	Upper Right Jet Bumper 42	3x 50	Release Target 150K 58
3 RED-ORN 2J7-3	Tilt 3	3,000 Bonus 11	20,000 Bonus 19	"R" 27	"B" 35	Upper Left Jet Bumper 43	5x 51	Release Arrow 59
4 RED-YEL 2J7-4	High Score 4	4,000 Bonus 12	40,000 Bonus 20	"E" 28	"C" 36	Lower Right Jet Bumper 44	Eject Hole 10K 52	Spinner 60
5 RED-GRN 2J7-5	Shoot Again 5	5,000 Bonus 13	60,000 Bonus 21	"P" 29	"D" 37	Left Flipper Return Lane 45	Eject Hole 20K 53	Not Used 61
6 RED-BLU 2J7-6	Shoot Again 6	6,000 Bonus 14	80,000 Bonus 22	"O" 30	Left Drain Special 38	Right Flipper Return Lane 46	Eject Hole 50K 54	Not Used 62
7 RED-VIO 2J7-9	Double Score 7	7,000 Bonus 15	Bonus Holdover 23	"W" 31	Right Drain Special 39	Mystery 47	Eject Hole Lock Arrow 55	Not Used 63
8 RED-GRY 2J7-8	Bonus Holdover 8	8,000 Bonus 16	Fire Power Special 24	"E" 32	Ball in Play 40	Extra Ball 48	Release Target 50K 56	Not Used 64

Figure 1. Lamp Matrix

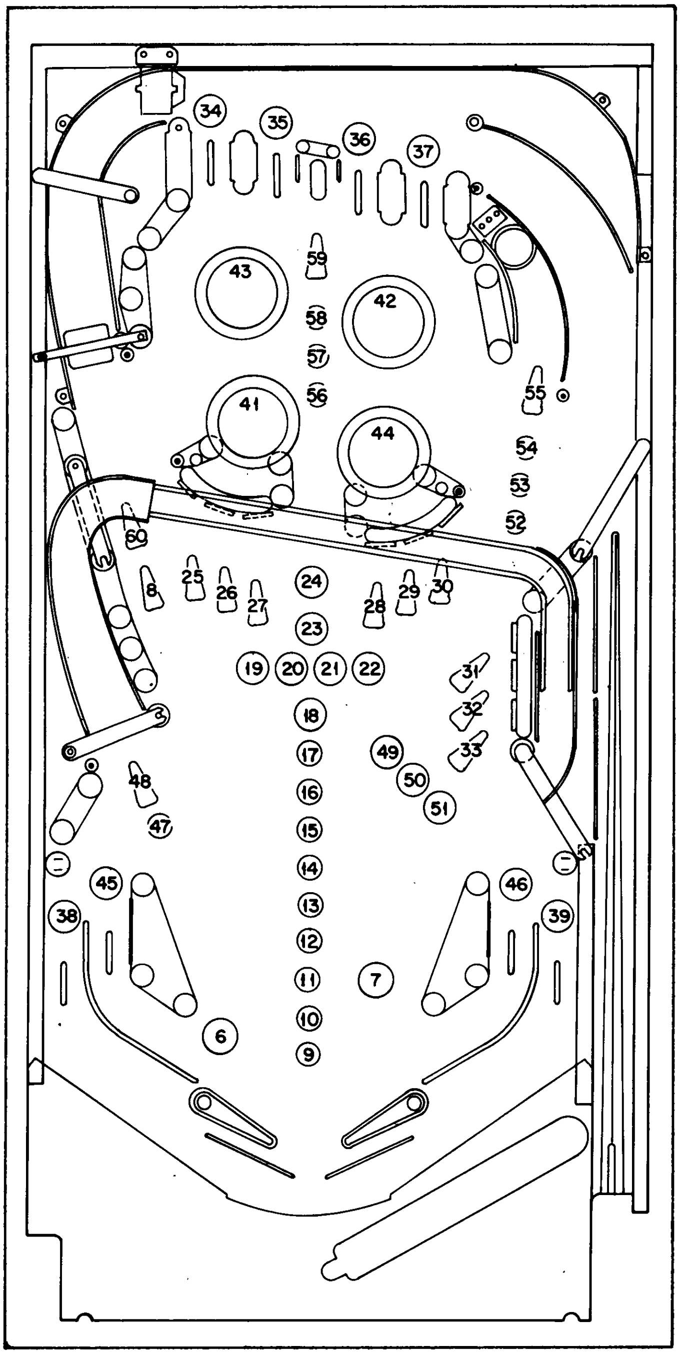


Figure 2. Lamp Locations

Lamp No.	Function	
1	Game Over	
2	Match	
3	Tilt	Backbox Lamps (1–5)
4	High Score	
5	Shoot Again	
6	Shoot Again	
7	Double Score	
8	Bonus Holdover	
9	1,000 Bonus	
10	2,000 Bonus	
11	3,000 Bonus	
12	4,000 Bonus	
13	5,000 Bonus	
14	6,000 Bonus	
15	7,000 Bonus	
16	8,000 Bonus	
17	9,000 Bonus	
18	10,000 Bonus	
19	20,000 Bonus	
20	40,000 Bonus	
21	60,000 Bonus	
22	80,000 Bonus	
23	Bonus Holdover	
24	Fire Power Special	
25	"F"	
26	"I"	
27	"R"	
28	"E"	
29	"P"	
30	"O"	
31	"W"	
32	"E"	
33	"R"	
34	"A"	
35	"B"	
36	"C"	
37	"D"	
38	Left Drain Special	
39	Right Drain Special	
40	Ball in Play	
41	Lower Left Jet Bumper	
42	Upper Right Jet Bumper	
43	Upper Left Jet Bumper	
44	Lower Right Jet Bumper	
45	Left Flipper Return Lane	
46	Right Flipper Return Lane	
47	Mystery	
48	Extra Ball	
49	2x	
50	3x	
51	5x	
52	Eject Hole 10K	
53	Eject Hole 20K	
54	Eject Hole 50K	
55	Eject Hole Lock Arrow	
56	Release Target 50K	
57	Release Target 100K	
58	Release Target 150K	
59	Release Arrow	
60	Spinner	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

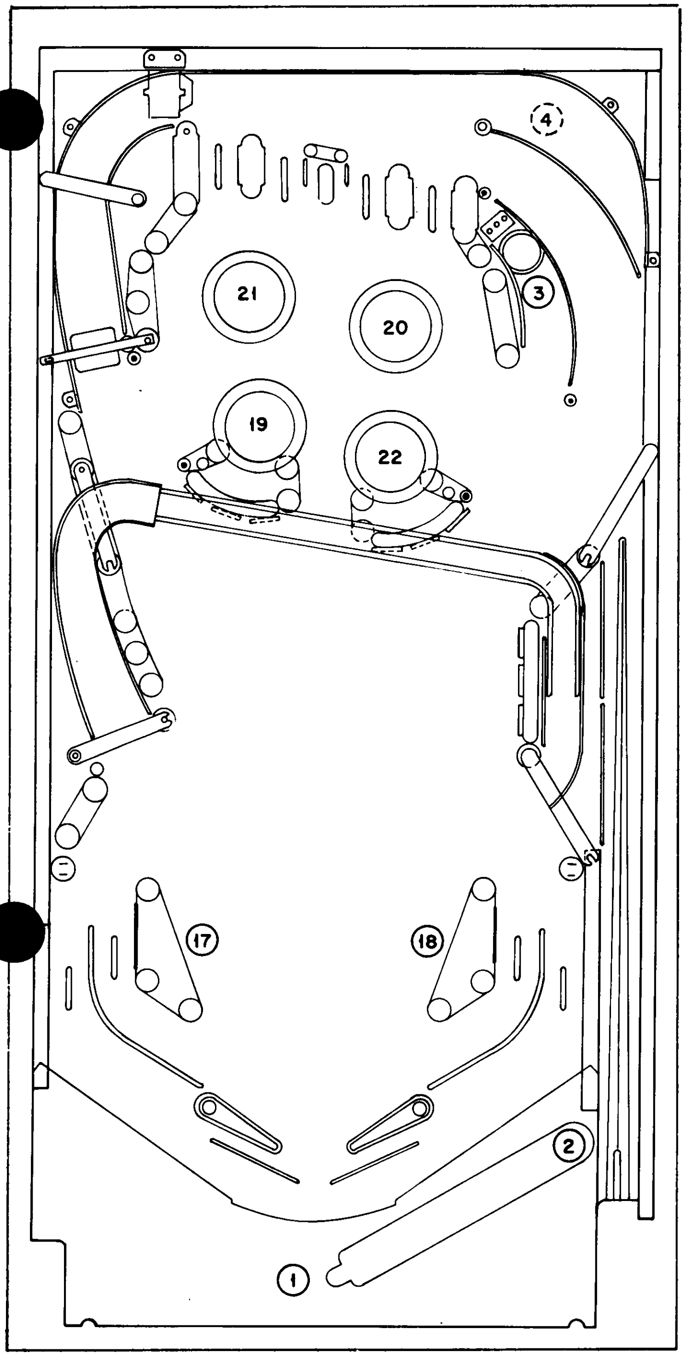


Figure 5. Solenoid Locations

SOLENOID TEST

1. From Lamp Test depress ADVANCE with the switch set to AUTO-UP. Test 02 should be indicated in the Credits display. The Match display sequences from 01 thru 25. Corresponding solenoids 01 thru 24 are pulsed. Flipper relationship is de-energized with subtest 25.

2. To continuously pulse a single solenoid set switch to MANUAL-DOWN. Operate ADVANCE pushbutton to sequence through the solenoids one at a time. Set switch to AUTO-UP to resume sequencing.

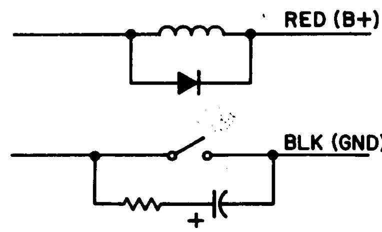
Sol. No.	Function
1	Outhole
2	Ball Ramp Thrower
3	Eject Hole
4	Orbit Complete Flash Lamps
5	Not Used
6	Not Used
7	Not Used
8	Not Used
9	Not Used
10	Not Used
11	Generall Illumination Relay
12	Not Used
13	Not Used
14	Not Used
15	Bell
16	Coin Lockout
17	Left Kicker
18	Right Kicker
19	Lower Left Jet Bumper
20	Upper Right Jet Bumper
21	Upper Left Jet Bumper
22	Lower Right Jet Bumper

Table 4. Solenoid Connection

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	SOLENOID PART NO.
01	Outhole	GRY-BRN	2P11-4, 8P3-1	Q15	SG1-23-850-DC
02	Ball Ramp Thrower	GRY-RED	2P11-5, 8P3-2	Q17	SA3-23-850-DC
03	Eject Hole	GRY-ORN	2P11-7, 8P3-3	Q19	SG1-23-850-DC
04	Orbit Complete Flash Lamps	GRY-YEL	2P11-8, 8P3-4	Q21	Type 83
05	Not Used	GRY-GRN	2P11-9, 8P3-5	Q23	
06	Not Used	GRY-BLU	2P11-3, 8P3-6	Q25	
07	Not Used	GRY-VIO	2P11-2, 8P3-7	Q27	
08	Not Used	GRY-BLK	2P11-1, 8P3-8	Q29	
09	Not Used	BRN-BLK	2P9-9, 8P3-9	Q31	
10	Not Used	BRN-RED	2P9-7, 8P3-10	Q33	
11	General Illumination Relay	BRN-ORN	2P9-1, 3P7-1	Q35	5580-09555
12	Not Used	BRN-YEL	2P9-2, 8P3-12	Q37	
13	Not Used	BRN-GRN	2P9-3, 8P3-13	Q39	
14	Not Used	BRN-BLU	2P9-4, 8P3-14	Q41	
15	Bell	BRN-VIO	2P9-5, 7P1-17	Q43	SM-29-1000-DC
16	Coin Lockout	BRN-GRY	2P9-6, 7P1-18, 7P2-4	Q45	904218-696
*17	Left Kicker	BLU-BRN	2P12-7, 8P3-17	Q2	SG1-23-850-DC
*18	Right Kicker	BLU-RED	2P12-4, 8P3-18	Q4	SG1-23-850-DC
*19	Lower Left Jet Bumper	BLU-ORN	2P12-4, 8P3-19	Q6	SG1-23-850-DC
*20	Upper Right Jet Bumper	BLU-YEL	2P12-6, 8P3-20	Q8	SG1-23-850-DC
*21	Upper Left Jet Bumper	BLU-GRN	2P12-8, 8P3-12	Q10	SG1-23-850-DC
*22	Lower Right Jet Bumper	BLU-BLK	2P12-9, 8P3-22	Q12	SG1-23-850-DC
	Right Flipper	BLU-VIO	2P12-1, 7P1-7	—	SFL-19-400/ 30-750-DC
	Left Flipper	BLU-GRY	2P12-2, 7P1-9	—	SFL-19-400/ 30-750-DC

*NOTES:

1. Special switch connections for solenoids 17 through 21 are as follows:
   17—ORN-BRN—2P13-5, 8P3-24
   18—ORN-RED—2P13-3, 8P3-25
   19—ORN-BLK—2P13-2, 8P3-26
   20—ORN-YEL—2P13-4, 8P3-27
   21—ORN-GRY—2P13-8, 8P3-28
2. Flipper button connections are as follows:
   Right—ORN-VIO—2P12-1, 7P1-7
   Left—ORN-GRY—2P12-2, 7P1-9
3. Sol. 16 is Coin-Co part number
4. Typical wiring for solenoids and special switches follows:



SWITCH TEST

1. From Solenoid Test depress ADVANCE with the switch set to AUTO-UP. Test 03 should be indicated in the Credits display and any stuck switches in the Master display. As stuck switch(es) is displayed a sound is produced. The display continuously cycles through the stuck switches and as they are opened, the number is removed from the sequence. When all switches are open, the Match display is blank and the sounds stop.

2. If all switches in a row are displayed, first verify that all are open and then check for a short to ground on the row wire.

3. Operate switches; a sound is produced and switch number is momentarily indicated in the ball in play display. If two switches in a row are indicated with one switch closed, check for a short between the column wires; for multiple indication check column wire for short to ground. If two switches in a column are indicated with one switch closed, check for short between row wires

4. If proper indications are obtained in Test 03 but matrix problem is suspected in game play, disconnect lamp connectors 2P5 and 2P7. Recheck game play. Perform CPU Self-Test if problem remains. If problem is cleared, check for short between lamp matrix and jet bumper mounting brackets.

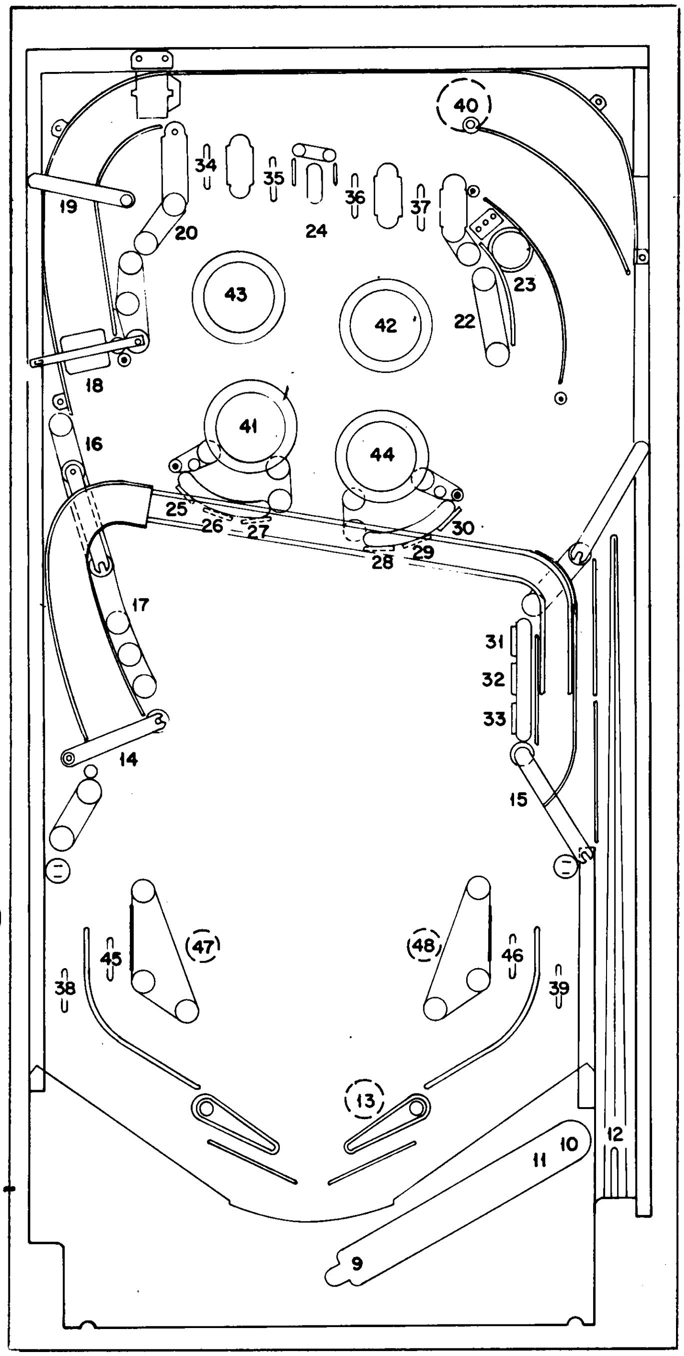


Figure 4. Switch Locations

Switch No.	Function	(Score)
1	Plumb Tilt	
2	Ball Roll Tilt	
3	Credit Button	
4	Right Coin	
5	Center Coin	
6	Left Coin	
7	Slam Tilt	
8	High Score Reset	
9	Outhole	
10	Right Ball Ramp	
11	Left Ball Ramp	
12	Ball Shooter Trough	
13	Lane Change	
14	Ramp in Roll Under	
15	Ramp out Roll Under	
16	Center Left Standup	(100)
17	Standup	(100)
18	Spinner	(100/1000)
19	Orbit in Roll Under	
20	Upper Left Standup	(50)
~~21~~	~~Not Used~~	
22	Upper Right Standup	(50)
23	Eject Hole	(5000/Lit Value)
24	Release Target	(1000)
25	"F" Target	(1000)
26	"I" Target	(1000)
27	"R" Target	(1000)
28	"E" Target	(1000)
29	"P" Target	(1000)
30	"O" Target	(1000)
31	"W" Target	(1000)
32	"E" Target	(1000)
33	"R" Target	(1000)
34	"A" Rollover	(1000)
35	"B" Rollover	(1000)
36	"C" Rollover	(1000)
37	"D" Rollover	(1000)
38	Left Outlane	(10,000)
39	Right Outlane	(10,000)
40	Orbit Out Gate	
41	Lower Left Jet Bumper	(100/1000)
42	Upper Right Jet Bumper	(100/1000)
43	Upper Left Jet Bumper	(100/1000)
44	Lower Right Jet Bumper	(100/1000)
45	Left Flipper Return Lane	(1000)
46	Right Flipper Return Lane	(1000)
47	Left Kicker	(10)
48	Right Kicker	(10)
49	Playfield Tilt	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	
54	Not Used	
55	Not Used	
56	Not Used	
57	Not Used	
58	Not Used	
59	Not Used	
60	Not Used	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

NOTE: Second value scored when lit

COLUMN / ROW	1 GRN-BRN 2J2-9	2 GRN-RED 2J2-8	3 GRN-ORN 2J2-7	4 GRN-YEL 2J2-6	5 GRN-BLK 2J2-5	6 GRN-BLU 2J2-3	7 GRN-VIO 2J2-2	8 GRN-GRY 2J2-1
1 WHT-BRN 2J3-9	Plumb Tilt 1	Outhole 9	Standup 100 17	"F" Target 1000 25	"R" Target 1000 33	Lower Left Jet Bumper 100/1000 41	Playfield Tilt 49	Not Used 57
2 WHT-RED 2J3-8	Ball Roll Tilt 2	Right Ball Ramp 10	Spinner 100/1000 18	"I" Target 1000 26	"A" Rollover 1000 34	Upper Right Jet Bumper 100/1000 42	Not Used 50	Not Used 58
3 WHT-ORN 2J3-7	Credit Button 3	Left Ball Ramp 11	Orbit in Roll Under 19	"R" Target 1000 27	"B" Rollover 1000 35	Upper Left Jet Bumper 100/1000 43	Not Used 51	Not Used 59
4 WHT-YEL 2J3-6	Right Coin 4	Ball Shooter Trough 12	Upper Left Standup 50 20	"E" Target 1000 28	"C" Rollover 1000 36	Lower Right Jet Bumper 100/1000 44	Not Used 52	Not Used 60
5 WHT-GRN 2J3-5	Center Coin 5	Lane Change 13	Not Used 21	"P" Target 1000 29	"D" Rollover 1000 37	Left Flipper Return Lane 1000 45	Not Used 53	Not Used 61
6 WHT-BLU 2J3-4	Left Coin 6	Ramp in Roll Under 14	Upper Right Standup 50 22	"O" Target 1000 30	Left Outlane 10,000 38	Right Flipper Return Lane 1000 46	Not Used 54	Not Used 62
7 WHT-VIO 2J3-3	Slam Tilt 7	Ramp out Roll Under 15	Eject Hole 5000/Lit Value 23	"W" Target 1000 31	Right Outlane 10,000 39	Left Kicker 10 47	Not Used 55	Not Used 63
8 WHT-GRY 2J3-1	High Score Reset 8	Center Left Standup 100 16	Release Target 1000 24	"E" Target 1000 32	Orbit Out Gate 40	Right Kicker 10 48	Not Used 56	Not Used 64

Figure 3. Switch Matrix

CPU BOARD SELF-TEST

Depress the DIAGNOSTIC pushbutton on the left side of the CPU Board. The following indications are provided. With 0 indication the game returns to the game over mode.

0 - Test Passed
1 - IC13 RAM Faulty
2 - IC16 RAM Faulty
3 - IC17 ROM 2 Faulty
4 - IC17 ROM 2 Faulty
5 - IC20 ROM 1 Faulty
6 - IC14 Game ROM 1 Faulty
7 - IC26 Game ROM 0 Faulty
8 - IC19 CMOS RAM or Memory Protect Circuit Faulty
9 - Coin-door closed, Memory Protect Circuit Faulty, or IC19 CMOS RAM Faulty.

Note that "0" remaining after power turn-on indicates CPU Board lockup.

SOUND BOARD SELF-TEST

Depress DIAGNOSTIC pushbutton on the top of the Sound Board. Several electronic sounds should be produced. This sequence of sounds is repeated until the game is turned OFF and back ON.

INITIATING AUTO-CYCLE MODE

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in Credit display and Function 00 in Match Display.
2. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50 in the Match Display.
3. Set switch to AUTO-UP and operate Credit button to indicate 15 in Player 1 Display.
4. Depress ADVANCE pushbutton to start Auto-Cycle mode. Each cycle of this mode sequences thru the Display Digits Test, Sound Test (00), Lamp Test (01), and Solenoid test (02).
5. To terminate the test and return to game over, turn the game OFF and back ON.

CHAPTER 4 Drawings

Backbox Wiring Diagram

CPU Board Assembly Drawing

CPU Board Logic

Driver Board Assembly Drawing

Driver Board Logic Diagram (Sheet 1 of 2)

Driver Board Logic Diagram (Sheet 2 of 2)

Power Supply Assembly and
Schematic Diagrams

Power Wiring Diagram

Sound Board Assembly Drawing

Sound Board Logic Diagram

Insert Board Wiring Diagram

C-8363 Master Display Board Assembly Drawing

C-8363 Master Display Board Logic Diagram

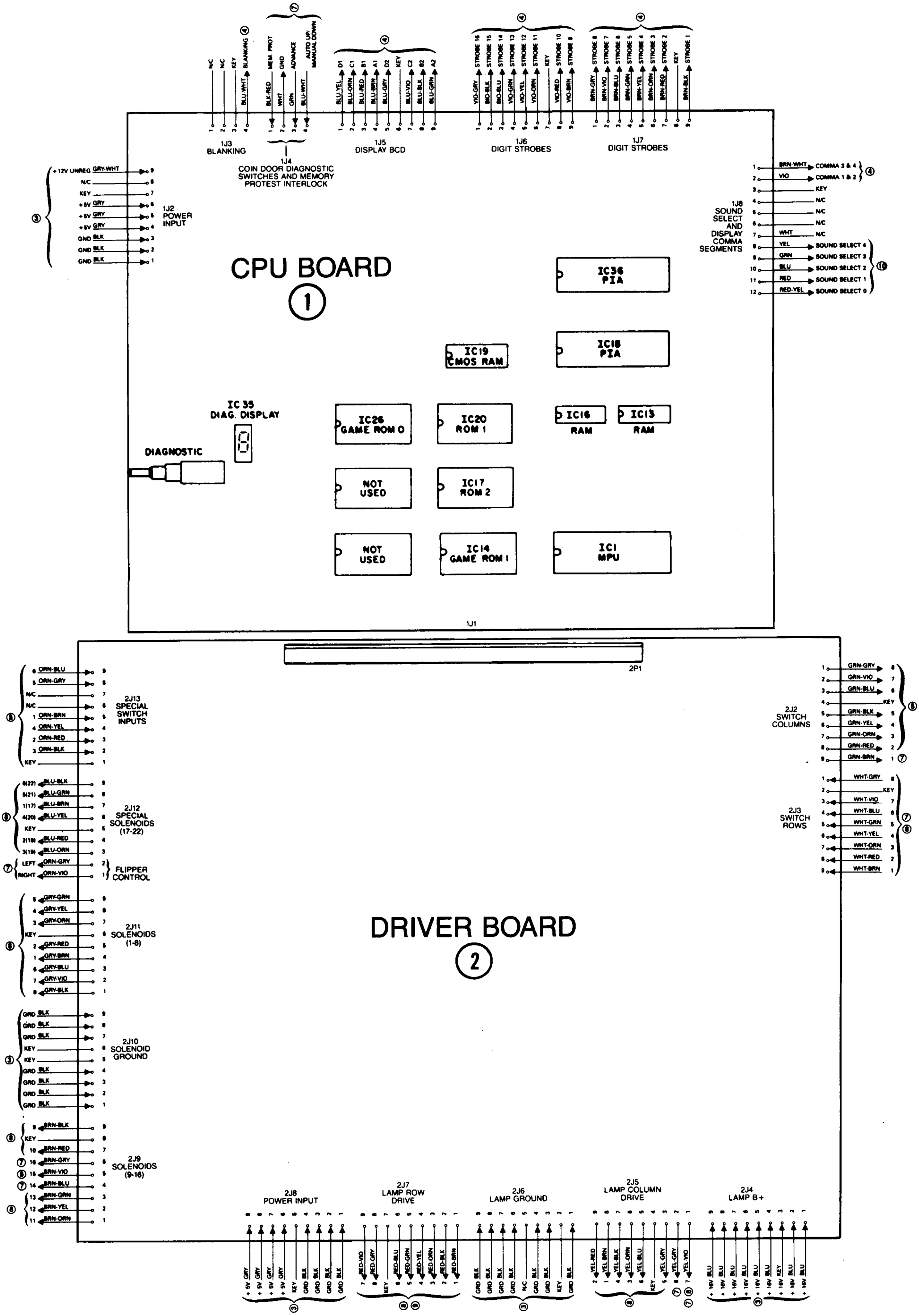
C-8364 and C-8365 Slave Display Board
Assembly and Schematic Diagrams

Cabinet Wiring Diagram

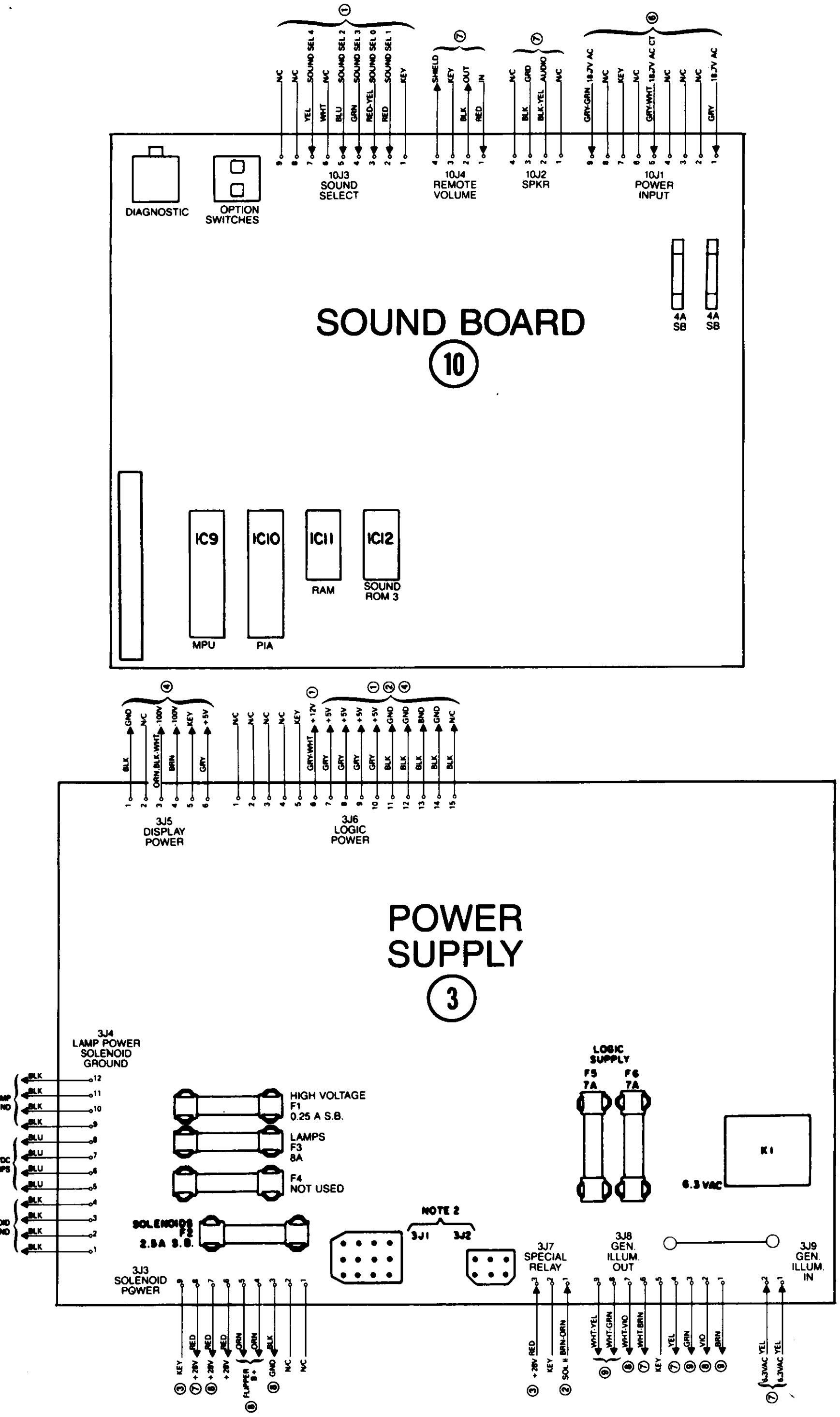
Playfield Lamp Wiring Diagram

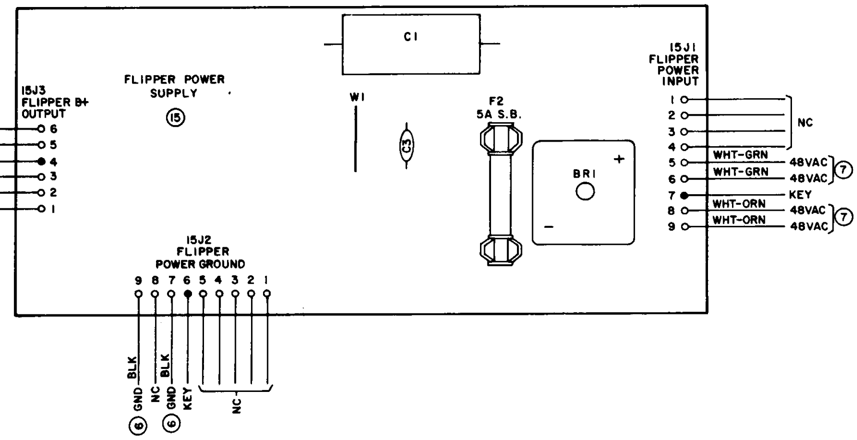
Solenoid Wiring Diagram

Playfield Switch Wiring Diagram



CPU BOARD
1
1J3 BLANKING
1J4 COIN DOOR DIAGNOSTIC SWITCHES AND MEMORY PROTEST INTERLOCK
1J5 DISPLAY BCD
1J6 DIGIT STROBES
1J7 DIGIT STROBES
1J2 POWER INPUT
1J8 SOUND SELECT AND DISPLAY COMMA SEGMENTS
IC36 PIA
IC18 PIA
IC19 CMOS RAM
IC35 DIAG. DISPLAY
DIAGNOSTIC
IC26 GAME ROM 0
IC20 ROM 1
IC16 RAM
IC13 RAM
NOT USED
IC17 ROM 2
NOT USED
IC14 GAME ROM 1
IC1 MPU
1J1
2P1
DRIVER BOARD
2
2J13 SPECIAL SWITCH INPUTS
2J12 SPECIAL SOLENOIDS (17-22)
FLIPPER CONTROL
2J11 SOLENOIDS (1-8)
2J10 SOLENOID GROUND
2J9 SOLENOIDS (9-16)
2J2 SWITCH COLUMNS
2J3 SWITCH ROWS
2J8 POWER INPUT
2J7 LAMP ROW DRIVE
2J6 LAMP GROUND
2J5 LAMP COLUMN DRIVE
2J4 LAMP B+



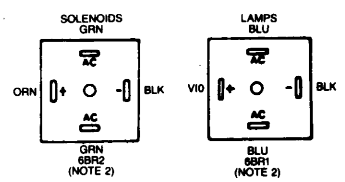


NOTES:

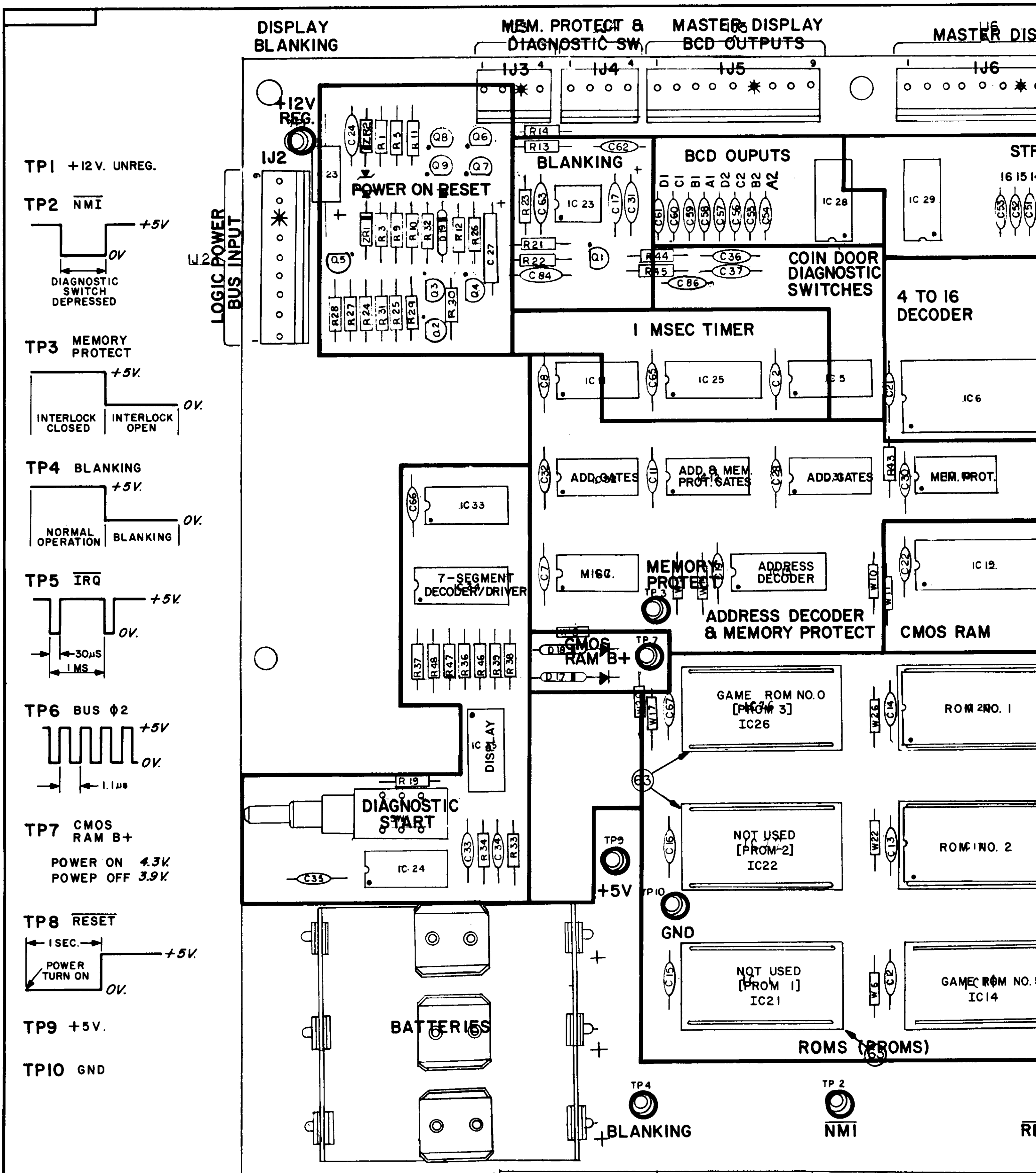
1. CONNECTIONS ARE INDICATED BY CIRCLED NUMBERS AS FOLLOWS:
   - ① CPU BOARD
   - ② DRIVER BOARD
   - ③ POWER SUPPLY BOARD
   - ④ MASTER DISPLAY BOARD
   - ⑤ SLAVE DISPLAY BOARD
   - ⑥ BACKBOX
   - ⑦ CABINET
   - ⑧ PLAYFIELD
   - ⑨ INSERT BOARD
   - ⑩ SOUND BOARD
   - ⑪ NOT ASSIGNED
   - ⑫ NOT ASSIGNED
   - ⑬ NOT ASSIGNED
   - ⑭ NOT ASSIGNED
   - ⑮ FLIPPER POWER SUPPLY
2. REFER TO POWER WIRING DIAGRAM FOR CONNECTIONS TO 3PI.

BILL OF MATERIAL FLIPPER POWER SUPPLY

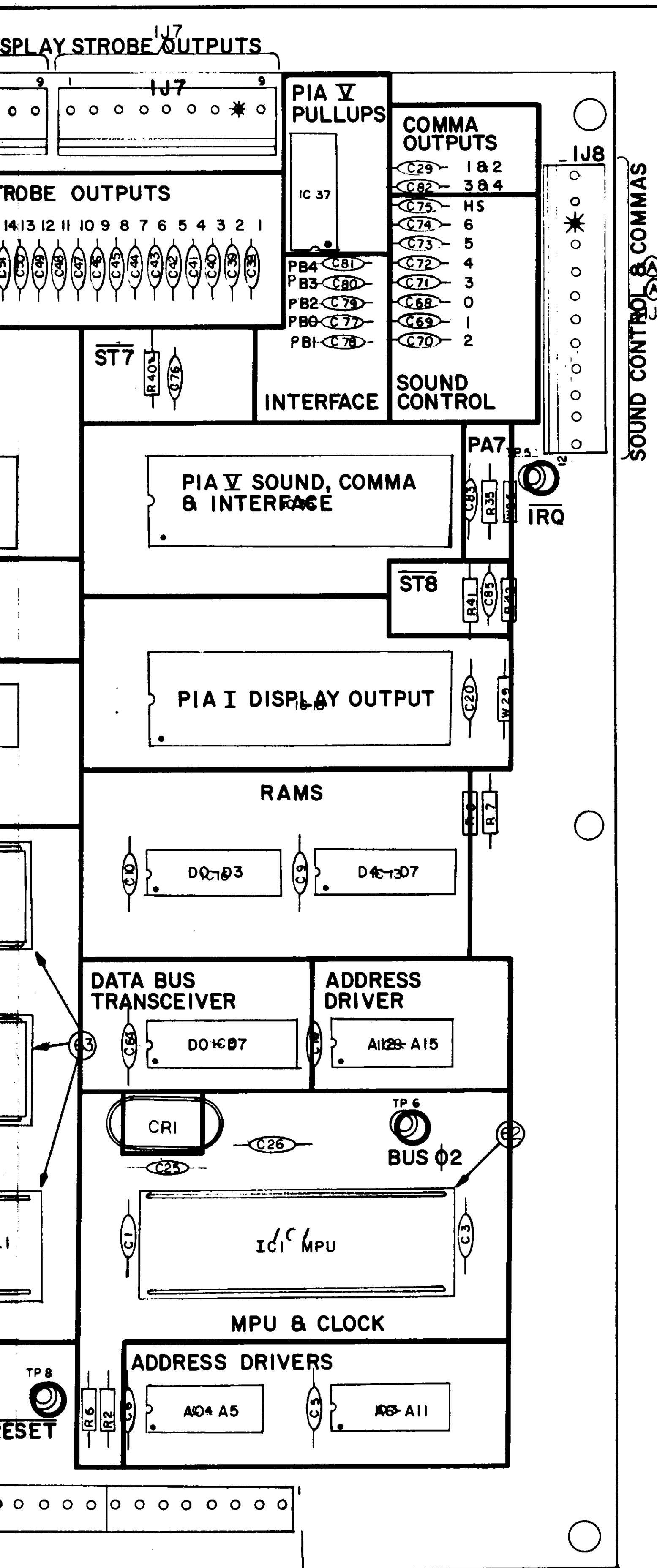
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION
1	5768-09725-00		BARE P.C. BOARD
2	5100-09690-00	BR1	BRDG. REC. 35A 200V
3	5040-09794-00	C1	CAP. ELECTROLITIC 100 uf 250V AXIAL
4	5043-09072-00	C3	CAP. CERAMIC 0.1 uf 500V
5	5731-09651-00	F2	FUSE 5A S.B. 250V
6	5732-09178-00		FUSE HOLDER
7	5791-09453-00	15J1 & 15J2	9 PIN HEADER
8	5791-09038-00	15J3	6 PIN HEADER



Backbox Wiring Dia



REVISION LETTER	REVISION	BY
A	ITEM No. 11 was 5341-09233-00, ITEM No 12 was 5341-09234-00,	10/10/80 G. H



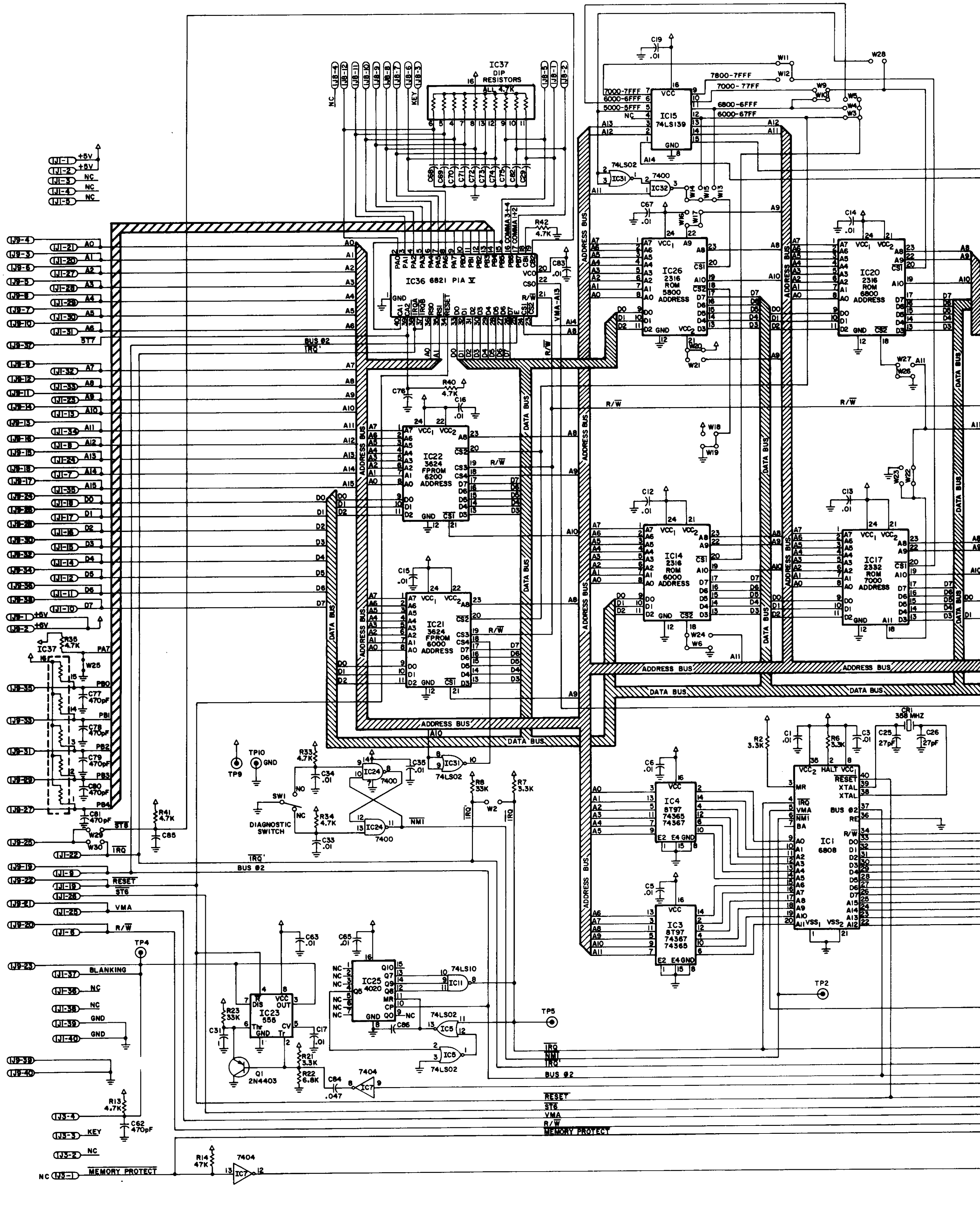
BILL OF MATERIAL

ITEM NO.	PART NO	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5764-09465-X0	-	BARE P.C. BOARD CPU	1
2				
3	5370-08989-00	IC3,IC4,IC8	8T97 HEX TRISTATE BUFFER	3
4	5281-09308-X0	IC9	74LS245 OCTAL BUFFER	1
5	5280-09010-00	IC6	74154 4 TO 16 DECODER	1
6	5280-09013-00	IC7	7404 HEX INVERTER	1
7	5281-09235-00	IC11	74LS10 TRIPPLE 3 INVERTER	1
8	5280-08973-00	IC12	7408 QUAD AND	1
9	5340-09409-X0	IC13, IC16	2114-45 1K X4 STATIC RAM	2
10	5281-09246-00	IC15	74LS139 DUAL 2 TO 4 LINE DECODER	1
11	5341-09553-00	IC20	ROM 2K X8 LOWER	1
12	5341-09554-00	IC17	ROM 4KX8 UPPER	1
13	5430-08972-00	IC18, IC36	MC6821 PIA	2
14	5340-09017-00	IC19	MC 5101 CMOS RAM	1
15	5431-09449-00	IC23	MC 1455P1 TIMER	1
16	5280-09073-00	IC24, IC32, IC33	7400 QUAD 2 INPUT NAND	3
17	5310-09236-00	IC25	4020 CMOS 14 BIT COUNTER	1
18	5310-09237-00	IC10	4071 CMOS QUAD 2 INPUT NOR	1
19	5281-09247-00	IC5, IC31	74LS02 QUAD 2 INPUT NOR	2
20	5280-09407-X0	IC34	7447 BCD. TO 7 SEG LED DISP	1
21	5671-09411-00	IC35	MAN 72A 7 SEG LED DISP	1
22	5019-09238-00	IC28, IC29	13 DIP RES./PACK 4.7K OHM	2
23	5019-09223-00	IC37	15 DIP RES/PACK 10K OHM	1
24	5645-09025-00	DS1, DS2	8 STD DIP SWITCHES	2
25	5075-09018-00	ZR1	1N5996 ZENER DIODE 6.8V	1
26	5075-09059-00	ZR2	1N5990 ZENER DIODE 3.9V	1
27	5070-08919-00	D17, D19	1N4148 DIODE	18
28	5160-08938-00	Q3-Q9	2N4401 NPN TRANSISTOR	7
29	5190-09016-00	Q1, Q2	2N4403 PNP TRANSISTOR	2
30	5070-09266-00	D18	1N5817 DIODE	1
31	5520-09020-00	CR1	CRYSTAL 3.58 MHZ	1
32	5010-09358-00	R5, R9, R20	RESISTOR FC 1K OHM 5% 1/4W	3
33	5010-08983-00	R2, R6-R8, R21, R28	RESISTOR FC 3.3K OHM 5% 1/4W	6
34	5010-08991-00	R13-R18, R29, R33-R35, R40, R42	RESISTOR FC 4.7K OHM 5% 1/4W	13
35	5010-09086-00	R22	RESISTOR FC 6.8K OHM 5% 1/4W	1
36	5010-09036-00	R19, R30	RESISTOR FC 100 OHM 5% 1/4W	2
37	5010-09187-00	R36-R39, R46-R50	RESISTOR FC 150 OHM 5% 1/4W	9
38	5010-09113-00	R23, R26	RESISTOR FC 33K OHM 5% 1/4W	2
39	5010-09034-00	R1, R3	RESISTOR FC 10K OHM 5% 1/4W	2
40	5010-09241-00	R25, R32, R10, R11	RESISTOR FC 22K OHM 5% 1/4W	4
41	5010-08998-00	R27	RESISTOR FC 2.2K OHM 5% 1/4W	1
42	5010-09039-00	R12	RESISTOR FC 10 OHM 5% 1/4W	1
43	5010-09442-00	R43	RESISTOR FC 330K OHM 5% 1/4W	1
44	5010-08997-00	R24, R31	RESISTOR FC 27K OHM 5% 1/4W	2
45	5010-09083-00	R44, R45	RESISTOR FC 470 OHM 5% 1/4W	2
46	5043-08980-00	C1-C22, C28, C30, C32-C37, C63-C67, C83	CAPACITOR CERAMIC .01MFD 50V	36
47	5040-08986-00	C23	CAPACITOR ELECT. 100MFD 10V	1
48	5043-08996-00	C24	CAPACITOR CERAMIC .1MFD 50V	1
49	5043-09169-00	C25 C26	CAPACITOR CERAMIC 27 PFD 1KV	2
50	5041-09243-00	C27	CAPACITOR TANT. 10 MFD 10V	1
51	5041-09031-00	C31	CAPACITOR TANT. 1MFD 25V	1
52	5043-09030-00	C84	CAPACITOR CERAMIC .047MFD 50V	1
53	5043-09065-00	C29, C38-C62, C68-C82, C85, C86	CAPACITOR CERAMIC 470PFD 50V	43
54				
55	SEE NOTE		SWITCH MOMENTARY	2
56	5881-09021-00		BATTERY HOLDER #171	1
57	5791-09026-00	1J1	HEADER 09-64-1083 8 PIN	5
58	5791-09028-00	1J3, 1J4	HEADER 09-65-1041 4 PIN	2
59				
60	5791-09027-00	1J2, 1J5-1J7	HEADER 09-65-1091 9 PIN	4
61	5791-09043-00	1J8	HEADER 09-65-1121 12 PIN	1
62	5700-08985-00		40 PIN IC SOCKET	1
63	5700-09004-00		24 PIN IC SOCKET	6
64	5010-09534-00	W3, W6, W8, W10, W11, W14, W17, W20, W25, W26, W29, W22	RESISTOR FC 0 OHM 1/4W	13
65	5824-09248-00	TP1-TP10	TEST TERMINALS #1502-1	10

NOTE: USE EITHER 5641-09312-00, 5641-09024-00 OR 5641-09371-00

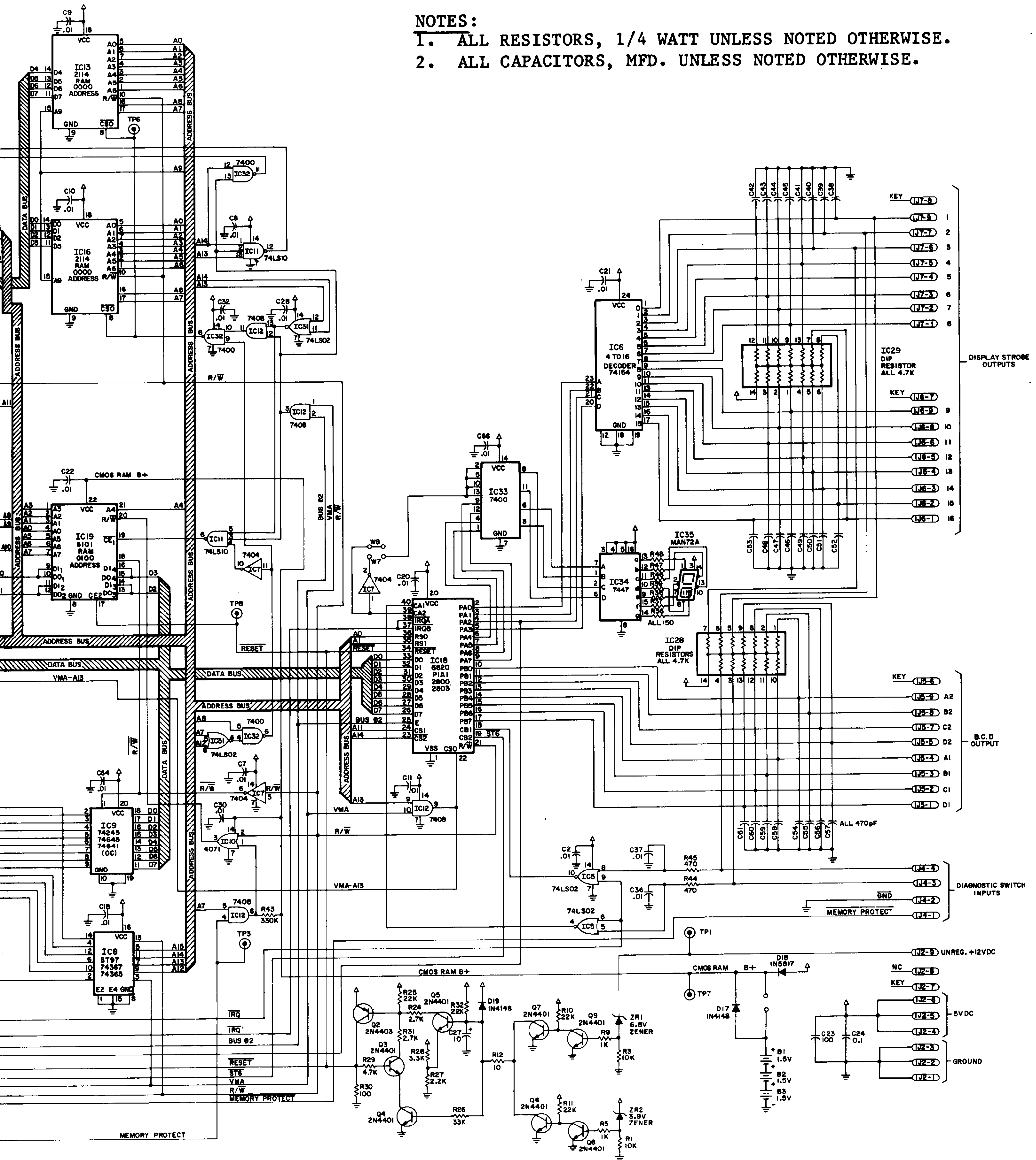
TOLERANCES			QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED FRACTIONAL ±1/64" DECIMAL ±.005" HOLE DIA. +.005 -.000" ANGULAR ±1/2° CONCENTRICITIES T.I.R. .005" SCREW THREADS CLASS 2	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. 3401 N. CALIFORNIA CHICAGO, ILL. 60618 267-2240			
	NAME PIN BALL CPU SUB-ASSEMBLY			
	MATERIAL	HEAT TREATMENT	FINISH	
DWN. G. HOBBS	DATE 9-20-80	APP'D.	SCALE	D-8342

CPU Board Assembly Drawing



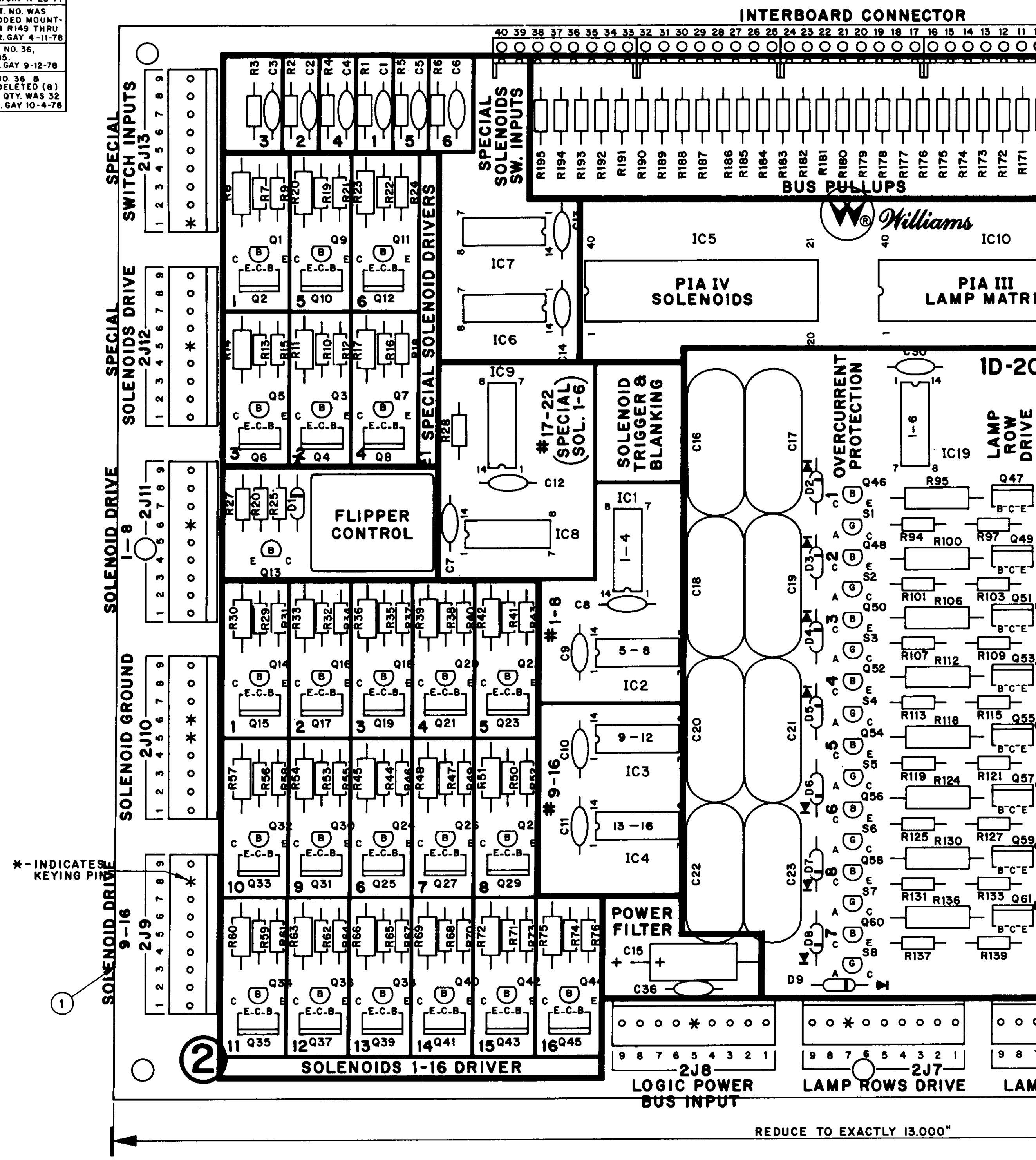
IC37 DIP RESISTORS ALL 4.7K
IC36 6821 PIA V
IC15 74LS139
7000-7FFF
6000-6FFF
5000-5FFF
7800-7FFF
7000-77FF
6800-6FFF
6000-67FF
74LS02
7400
IC26 2316 ROM 5800 ADDRESS
IC20 2316 ROM 6800 ADDRESS
IC22 3624 FPROM 6200 ADDRESS
IC21 3624 FPROM 6000 ADDRESS
IC14 2316 ROM 6000 ADDRESS
IC17 2332 ROM 7000 ADDRESS
ADDRESS BUS
DATA BUS
IC4 8T97 74365 74367
IC3 8T97 74367 74365
IC1 6808
CR1 3.58 MHZ
IC23 555
IC25 4020
74LS10
Q1 2N4403
7404
DIAGNOSTIC SWITCH
SW1
TP10 GND
TP9
TP4
TP5
TP2
BLANKING
RESET
ST6
VMA
R/W
MEMORY PROTECT
IRQ
NMI
BUS Ø2
KEY
NC
GND
+5V

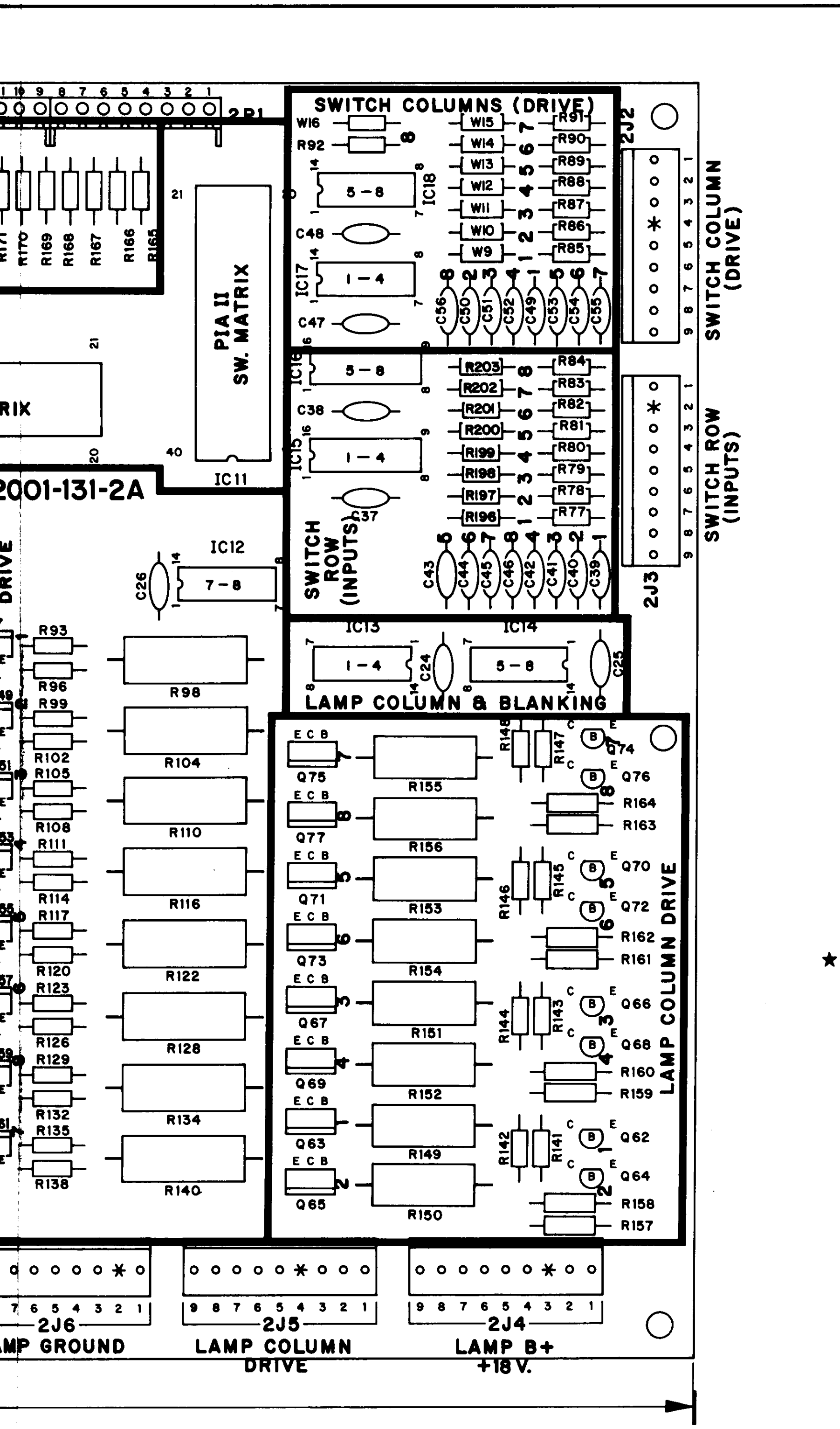
NOTES:
1. ALL RESISTORS, 1/4 WATT UNLESS NOTED OTHERWISE.
2. ALL CAPACITORS, MFD. UNLESS NOTED OTHERWISE.



CPU Board Logic Diagram

REVISION LETTER	REVISION
C	REVISED AND REDRAWN R. GAY 11-28-77
D	ITEM NO. 28, PT. NO. WAS 5A-8999 & ADDED MOUNTING NOTE FOR R149 THRU R156. R. GAY 4-11-78
E	DELETED ITEM NO. 36, PT. NO. 5A-8985. E.C.O. R. GAY 9-12-78
F	ADDED ITEM NO. 36 & ITEM NO. 22, DELETED (8) RESISTORS & QTY. WAS 32 E.C.O. 4624 R. GAY 10-4-78

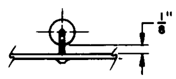




BILL OF MATERIAL

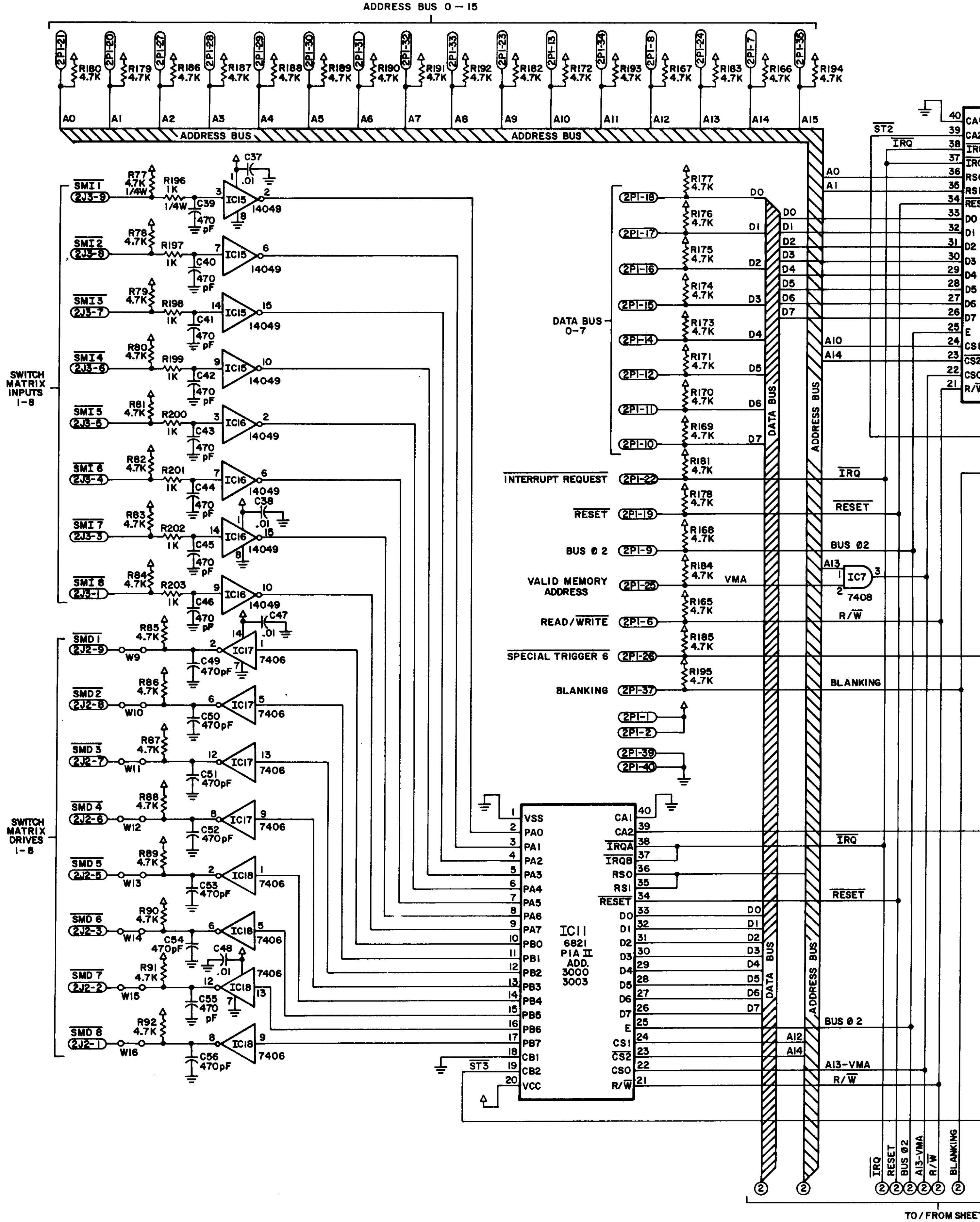
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-131		BARE P.C. BOARD	1
2	5A-8948	IC8, IC9	N7402 QUADRUPLE 2 INPUT POSITIVE NOR GATE	2
3	5A-8974	IC12, IC17, IC18, IC19	N7406 HEX. INVENTER BUFFER DRIVERS W/OPEN COLLECTOR HIGH VOLTAGE OUTPUTS	4
4	5A-8973	IC1 THRU IC4, IC6, IC7, IC13, IC14	N7408 QUADRUPLE 2 INPUT POSITIVE AND GATE	8
5	5A-8975	IC15, IC16	MC14049 INVERTING HEX. BUFFER	2
6	5A-8972	IC5, IC10, IC11	MC6820 PERIPHERAL INTERFACE ADAPTER	3
7	5A-8938	Q1, Q3, Q5, Q7, Q9, Q11 Q13, Q14, Q16, Q18, Q20, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q38, Q40, Q42, Q44	2N4401 NPN TRANSISTOR	23
8	5A-8976	Q46, Q48, Q50, Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66, Q68, Q70, Q72, Q74, Q76	2N6427 DARLINGTON NPN TRANSISTOR	16
9	5A-8977	Q2, Q4, Q6, Q8, Q10, Q12, Q15, Q17, Q19, Q21, Q25, Q27, Q29, Q31, Q33, Q35, Q37, Q39, Q41, Q43, Q45	TIP122 DARLINGTON NPN POWER TRANSISTOR	22
10	5A-8978	Q63, Q65, Q67, Q69, Q71, Q73, Q75, Q77,	TIP42 PNP POWER TRANSISTOR	8
11	5A-8979	Q47, Q49, Q51, Q53, Q55, Q57, Q59, Q61	2N6122 NPN POWER TRANSISTOR	8
12	5A-6258	D1	1N4001 DIODE	1
13	5A-8919	D2 THRU D9	1N4148 DIODE	8
14	5A-9014	S1 THRU S8	2N5060 SCR	8
15	5A-8980	C1 THRU C14, C24, THRU C26, C30, C37, C38, C47, C48	CAPACITOR, CERAMIC, .01 MFD. +80 -20 % 50 V.	22
16	5A-8995	C16 THRU C23	CAPACITOR, POLYESTER FILM, .1 MFD. 10 %	7
17	5A-9065	C37 THRU C46, C49 THRU C56	CAPACITOR, CERAMIC, 470 PFD. 20% 50 V.	16
18	5A-8986	C15	CAPACITOR, ELECT., 100 MFD. 10 V.	1
19	5A-8996	C36	CAPACITOR, CERAMIC, 1 MFD. +80 -20 % 50 V.	1
20	5A-8991	R1 THRU R6, R27, R77 THRU R92, R157 THRU R195	RESISTOR, FC, 4.7 K OHM 10% 1/4 W	62
21	5A-8983	R27	RESISTOR, FC, 3.3 K OHM 10% 1/4 W	1
22	5A-8984	R96, R97, R102, R103, R108, R109, R114, R115, R121, R122, R126, R127, R132, R133, R138, R139, R196 THRU R203	RESISTOR, FC, 1K OHM 10% 1/4 W	24
23	5A-8992	R7, R10, R13, R16, R19, R22, R29, R32, R35, R38, R41, R44, R47, R50, R53, R56, R59, R62, R65, R68, R71, R74	RESISTOR, FC, 560 OHM 10% 1/4 W	22
24	5A-8993	R8, R11, R14, R17, R20, R23, R30, R33, R36, R39, R42, R45, R48, R51, R54, R57, R60, R63, R66, R69, R72, R75	RESISTOR, FC, 68 OHM 10% 1/2 W	22
25	5A-8997	R9, R12, R15, R18, R21, R24, R25, R31, R34, R37, R40, R43, R46, R49, R52, R55, R58, R61, R64, R67, R70, R73, R76	RESISTOR, FC, 2.7 K OHM 10% 1/4 W	23
26	5A-8817	R26	RESISTOR, FC, 10 K OHM 10% 1/4 W	1
27	5A-8998	R141 THRU R148	RESISTOR, FC, 2.2 K OHM 10% 1/4 W	8
★ 28	5A-8999-1	R149 THRU R156	RESISTOR, FC, 27 OHM 10% 2 W	8
29	5A-9084	R95, R100, R106, R112, R118, R124, R130, R136	RESISTOR, FC, 100 OHM 10% 3 W	8
30	5A-9085	R93, R99, R105, R111, R117, R123, R129, R135	RESISTOR, FC, 1.5 K OHM 10% 1/4 W	8
31	5A-9086	R94, R101, R107, R113, R119, R125, R131, R137	RESISTOR, FC, 6.8 K OHM 10% 1/4 W	8
32	5A-9037	R98, R104, R110, R116, R122, R128, R134, R140	RESISTOR, WIREWOUND, .4 OHM 10% 3 WATT	8
33	5A-8994	Z1	RELAY - 4 POLE - 5 AMP. CONTACTS 40 OHM COIL 6 V.D.C.	1
34	5A-9066	2P1	8 PIN RECEPTACLE	5
35	5A-9027	2J2 THRU 2J13	9 PIN HEADER	12
36	5A-[illegible]534	W9 THRU W16	RESISTOR, FC, 0 OHM, 1/4 W	8

★ R149 THRU R156 MUST BE MOUNTED 1/8" ABOVE SURFACE OF BOARD.

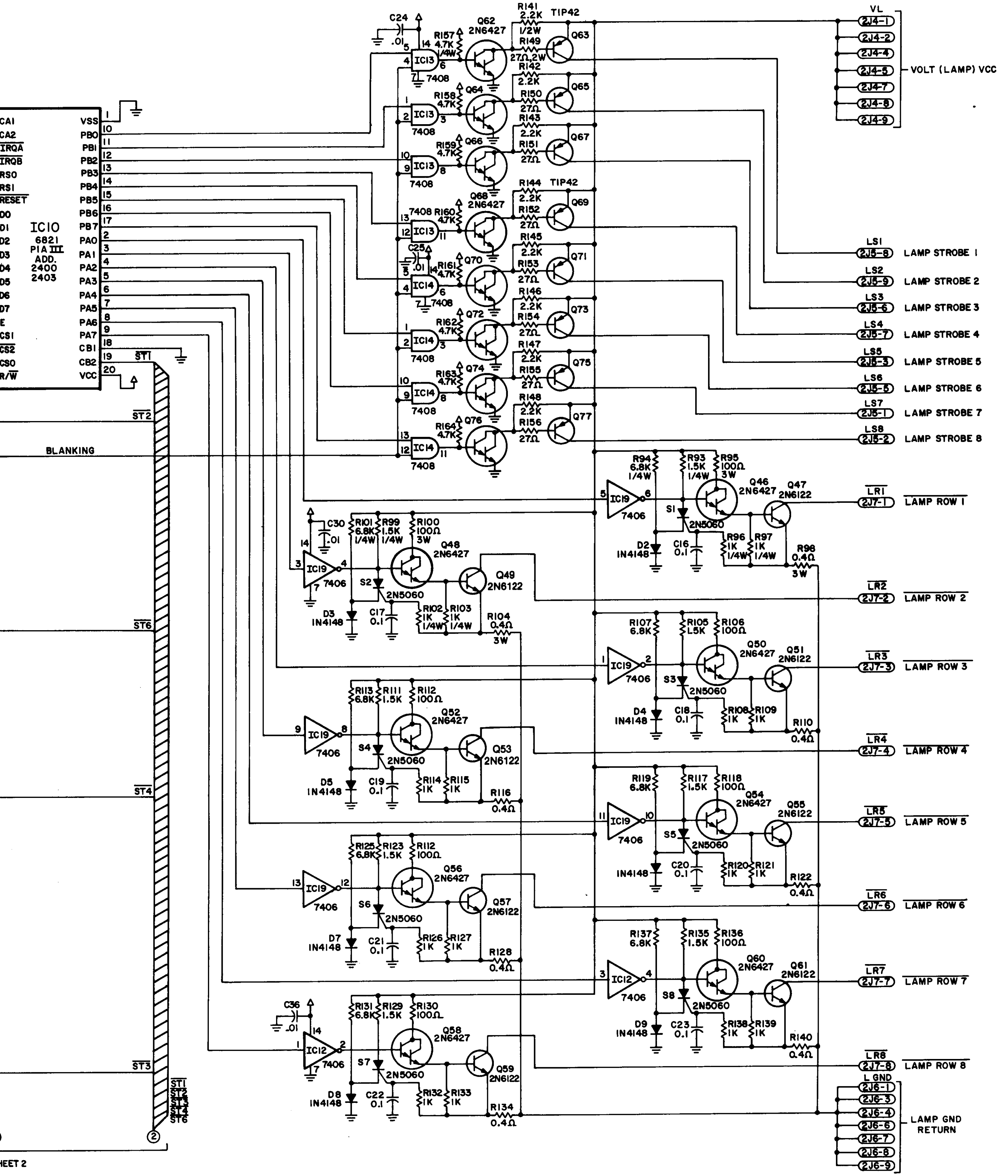


WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF XCOR CORPORATION
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

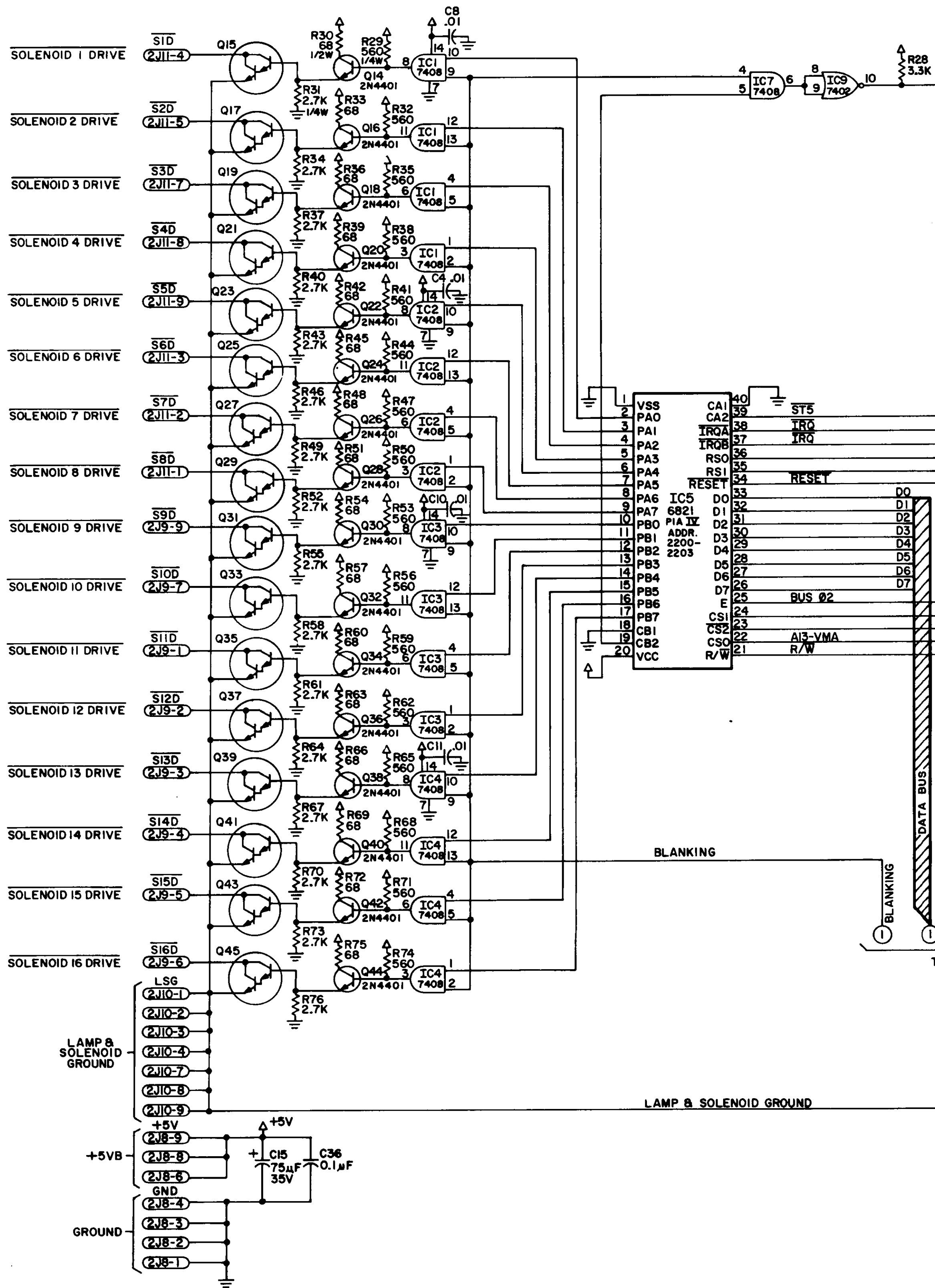
PART NAME				
DRIVER BOARD ASSEMBLY				
DWN. R. Gay	DATE 8-16-77	APP'D.	SCALE 2=1	PART NO. D-7997



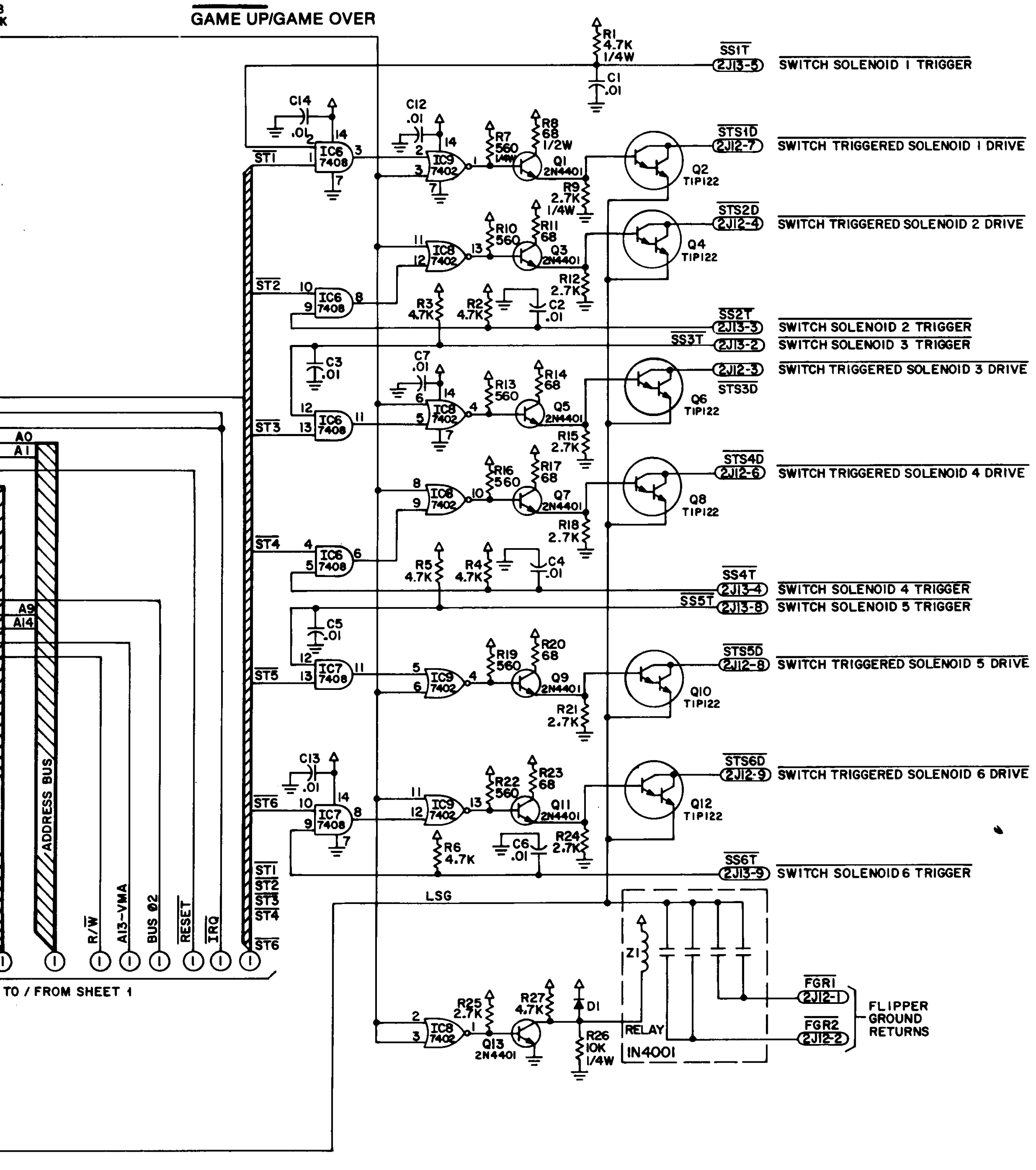
ADDRESS BUS 0 — 15
A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15
ADDRESS BUS
R180 4.7K R179 4.7K R186 4.7K R187 4.7K R188 4.7K R189 4.7K R190 4.7K R191 4.7K R192 4.7K R182 4.7K R172 4.7K R193 4.7K R167 4.7K R183 4.7K R166 4.7K R194 4.7K
SWITCH MATRIX INPUTS 1-8
SMI 1 2J3-9
SMI 2 2J3-8
SMI 3 2J3-7
SMI 4 2J3-6
SMI 5 2J3-5
SMI 6 2J3-4
SMI 7 2J3-3
SMI 8 2J3-1
IC15 14049
IC16 14049
SWITCH MATRIX DRIVES 1-8
SMD 1 2J2-9 W9
SMD 2 2J2-8 W10
SMD 3 2J2-7 W11
SMD 4 2J2-6 W12
SMD 5 2J2-5 W13
SMD 6 2J2-3 W14
SMD 7 2J2-2 W15
SMD 8 2J2-1 W16
IC17 7406
IC18 7406
DATA BUS 0-7
INTERRUPT REQUEST 2P1-22
RESET 2P1-19
BUS Ø 2 2P1-9
VALID MEMORY ADDRESS 2P1-25
READ/WRITE 2P1-6
SPECIAL TRIGGER 6 2P1-26
BLANKING 2P1-37
VMA
IC7 7408
IC11 6821 PIA II ADD. 3000 3003
VSS PA0 PA1 PA2 PA3 PA4 PA5 PA6 PA7 PB0 PB1 PB2 PB3 PB4 PB5 PB6 PB7 CB1 CB2 VCC
CA1 CA2 IRQA IRQB RS0 RS1 RESET D0 D1 D2 D3 D4 D5 D6 D7 E CS1 CS2 CS0 R/W
ST2 ST3
IRQ RESET BUS Ø2 A13-VMA R/W BLANKING
TO / FROM SHEET

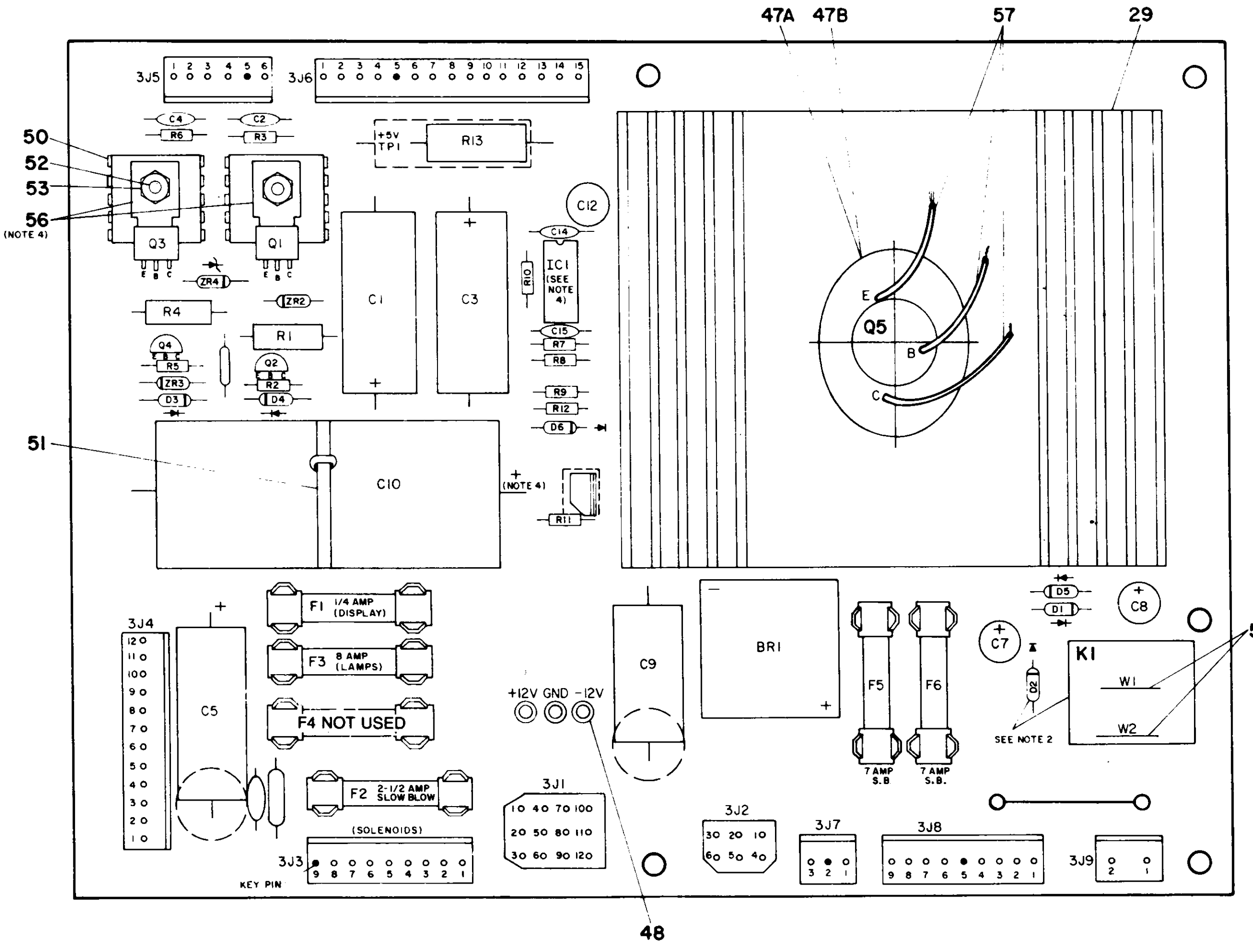


Driver Board Logic Diagram (Sheet 1 of 2)



SOLENOID 1 DRIVE
SOLENOID 2 DRIVE
SOLENOID 3 DRIVE
SOLENOID 4 DRIVE
SOLENOID 5 DRIVE
SOLENOID 6 DRIVE
SOLENOID 7 DRIVE
SOLENOID 8 DRIVE
SOLENOID 9 DRIVE
SOLENOID 10 DRIVE
SOLENOID 11 DRIVE
SOLENOID 12 DRIVE
SOLENOID 13 DRIVE
SOLENOID 14 DRIVE
SOLENOID 15 DRIVE
SOLENOID 16 DRIVE
S1D 2J11-4
S2D 2J11-5
S3D 2J11-7
S4D 2J11-8
S5D 2J11-9
S6D 2J11-3
S7D 2J11-2
S8D 2J11-1
S9D 2J9-9
S10D 2J9-7
S11D 2J9-1
S12D 2J9-2
S13D 2J9-3
S14D 2J9-4
S15D 2J9-5
S16D 2J9-6
LSG
2J10-1
2J10-2
2J10-3
2J10-4
2J10-7
2J10-8
2J10-9
LAMP & SOLENOID GROUND
+5V
2J8-9
2J8-8
2J8-6
+5VB
GND
2J8-4
2J8-3
2J8-2
2J8-1
GROUND
C15 75µF 35V
C36 0.1µF
Q14 2N4401
R30 68 1/2W
R29 560 1/4W
R31 2.7K 1/4W
C8 .01
IC1 7408
IC2 7408
IC3 7408
IC4 7408
IC7 7408
IC9 7402
R28 3.3K
IC5 6821 PIA IV ADDR. 2200-2203
VSS
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
CB1
CB2
VCC
CA1
CA2
IRQA
IRQB
RS0
RS1
RESET
D0
D1
D2
D3
D4
D5
D6
D7
E
CS1
CS2
CS0
R/W
ST5
IRQ
RESET
BUS Ø2
A13-VMA
R/W
BLANKING
DATA BUS


GAME UP/GAME OVER
SS1T
2J13-5
SWITCH SOLENOID 1 TRIGGER
STS1D
2J12-7
SWITCH TRIGGERED SOLENOID 1 DRIVE
STS2D
2J12-4
SWITCH TRIGGERED SOLENOID 2 DRIVE
SS2T
2J13-3
SWITCH SOLENOID 2 TRIGGER
SS3T
2J13-2
SWITCH SOLENOID 3 TRIGGER
2J12-3
SWITCH TRIGGERED SOLENOID 3 DRIVE
STS3D
STS4D
2J12-6
SWITCH TRIGGERED SOLENOID 4 DRIVE
SS4T
2J13-4
SWITCH SOLENOID 4 TRIGGER
SS5T
2J13-8
SWITCH SOLENOID 5 TRIGGER
STS5D
2J12-8
SWITCH TRIGGERED SOLENOID 5 DRIVE
STS6D
2J12-9
SWITCH TRIGGERED SOLENOID 6 DRIVE
SS6T
2J13-9
SWITCH SOLENOID 6 TRIGGER
LSG
FGR1
2J12-1
FGR2
2J12-2
FLIPPER GROUND RETURNS
RELAY
IN4001
ADDRESS BUS
R/W
A13-VMA
BUS Ø2
RESET
IRQ
ST1
ST2
ST3
ST4
ST6
TO / FROM SHEET 1

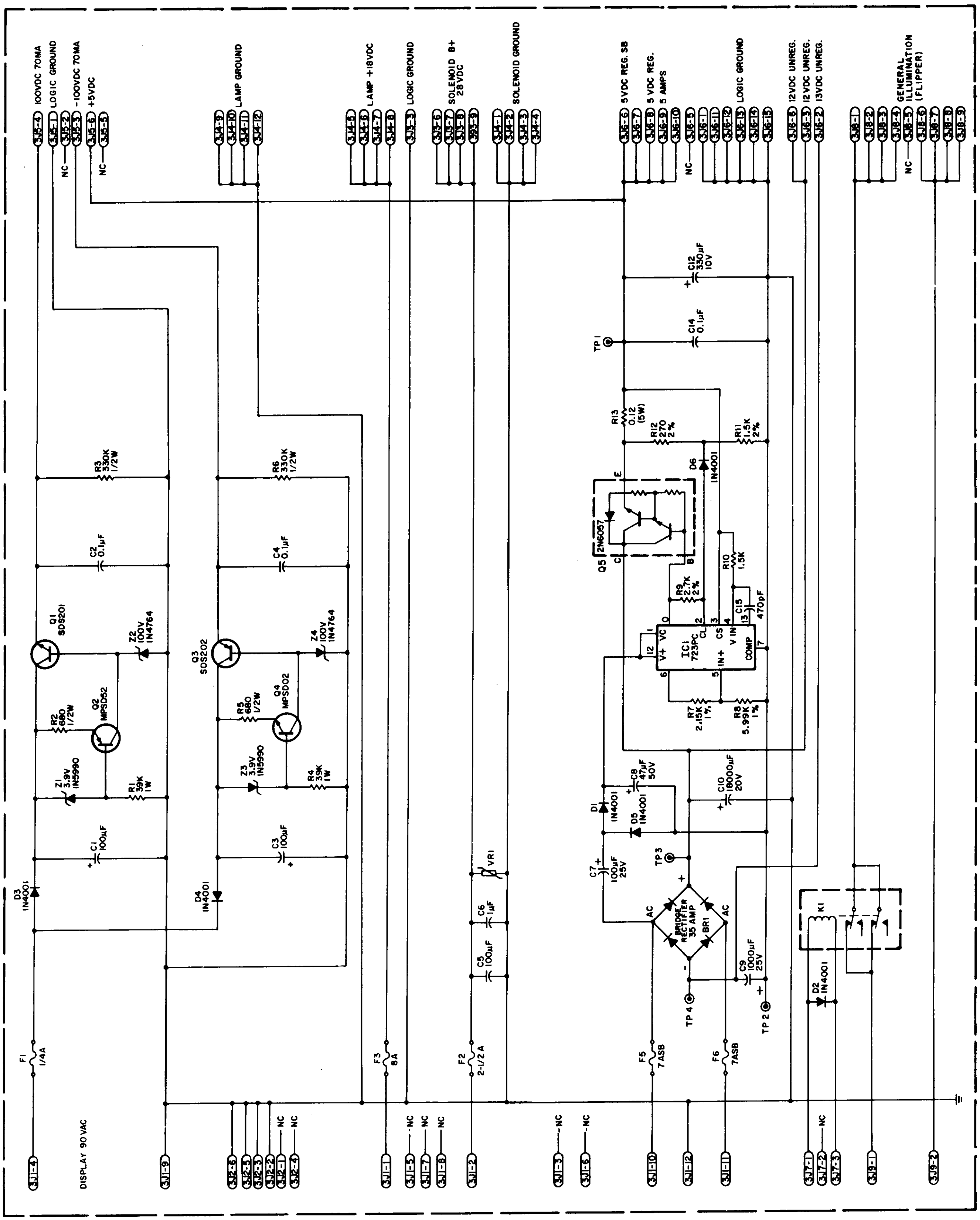


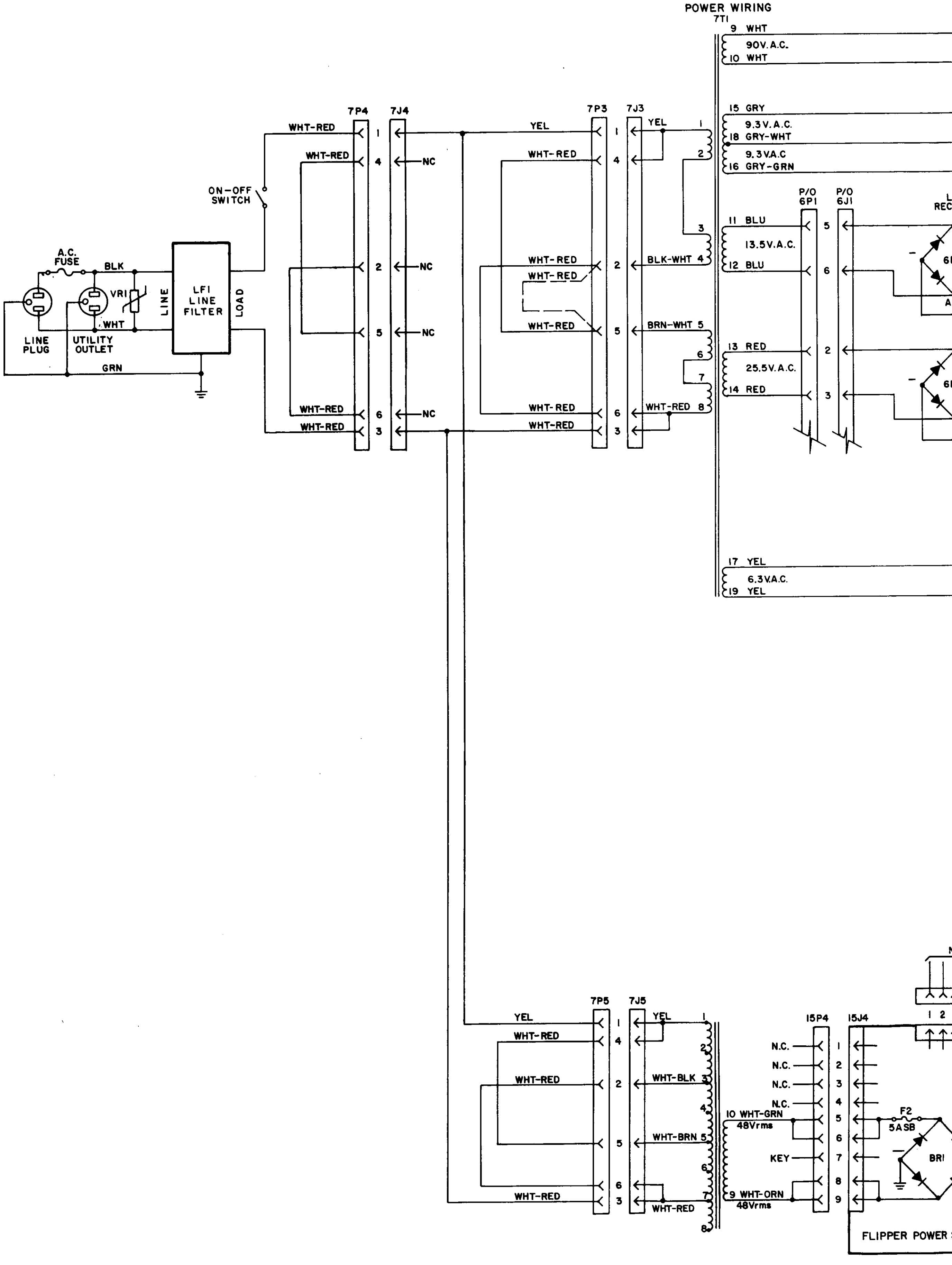
NOTES:

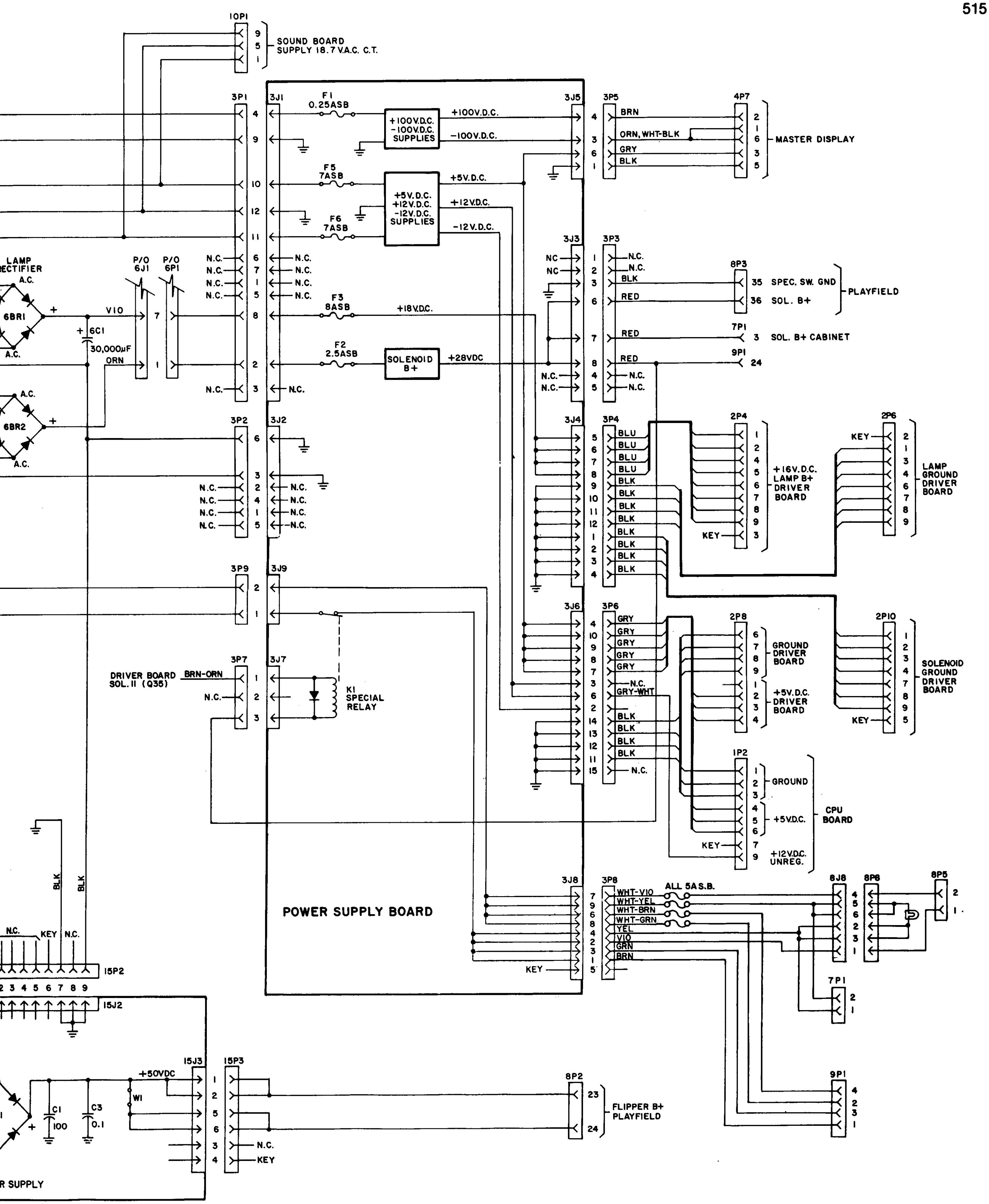
1. HEAT SINK COMPOUND MUST BE APPLIED BETWEEN TRANSISTOR AND HEAT SINK.
2. FOR BLACKOUT AND FUTURE GAME WITH SAME FEATURE REMOVE JUMPERS (W1 & W2)
   AND INSERT RELAY K1, DIODE, D2 AND 3J7.
3. OBSERVE INDEX MARK OF INEGRATED CIRCUIT, POLARITY OF CAPACITORS, DIODE AND POSITION OF TRANSISTORS.
4. REFERENCE DWG'S: SCHEMATIC 16-8786.

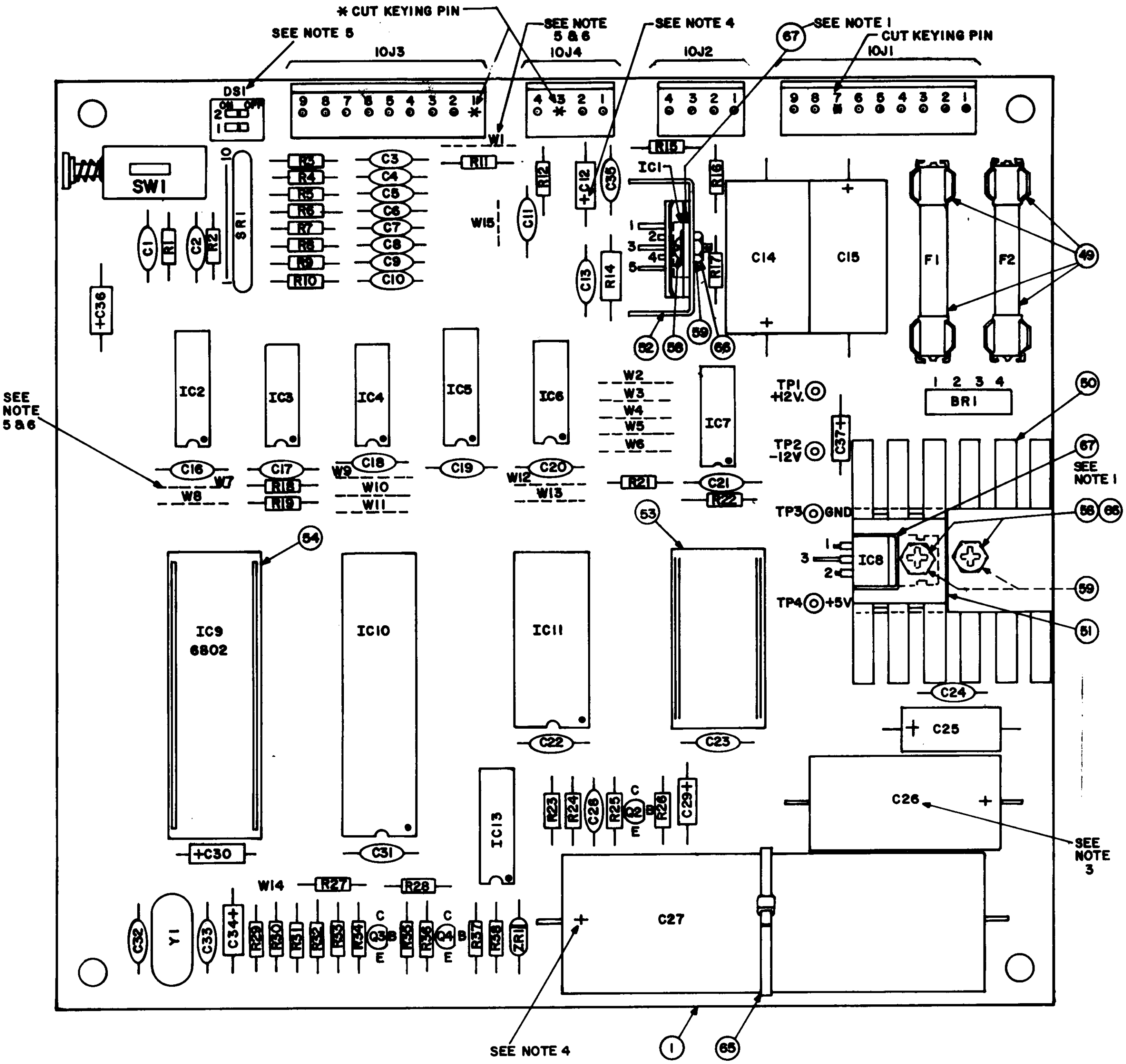
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5765-09466		BARE P.C. BOARD	1
2	5013-09426	R7	RESISTOR, 2.15K, 1%, 1/4 W, METAL FILM	1
3	5013-09427	R8	RESISTOR, 4.99K, 1%, 1/4 W, METAL FILM	1
4	5010-09428	R11	RESISTOR, 1.5K, 2%, 1/4 W, CARBON FILM	1
5	5010-09085	R10	RESISTOR, 2.7K, 2%, 1/4 W	1
6	5010-09541	R9	RESISTOR, 2.7K, 2%, 1/4 W	1
7	5010-09508	R12	RESISTOR, 270 OHM, 2% 1/4 W, CARBON FILM	1
8	5012-09429	R13	POWER RESISTOR, 0.12 OHM, 5%, 5W	1
9	5010-09536	R1, R4	RESISTOR, 39K, 5%, 1 W	2
10	5010-09061	R2, R5	RESISTOR, 680 OHM, 2 W	2
11	5010-09069	R3, R6	RESISTOR, 330K, 5%, 1/2 W	2
12	5040-09419	C10	CAP.,ELECTROLYTIC, 18,000 MFD, 20V, AXIAL	1
13	5040-09420 5040-08893	C9	CAP.,ELECTROLYTIC 1,000 MFD 25V, RADIAL OR AXIAL	1
14	5040-09423	C12	CAP.,ELECTROLYTIC 330 MFD, 10V, RADIAL	1
15	5043-09065	C15	CAPACITOR, 470 pFD	1
16	5040-09053	C1, C3	CAPACITOR, 100 MFD,ELECT.,150V	2
17	5040-09070 5043-09537	C5	CAPACITOR, 100 MFD, ELECT., 100V, AXIAL OR RADIAL	1
18	5070-09446	C14	CAPACITOR, 0.1 MFD, 50V, DISC.	1
19	5070-06258	D1,D2,D3,D4,D5,D6	DIODE, IN4001	6
20	5075-09059	ZR1, ZR3	ZENER, IN5990, 3.9V, 5%	2
21	5075-09060	ZR2, ZR4	ZENER, IN4764, 100V, 5%	2
22	5060-09424	IC1	VOLTAGE REGULATOR, MC1723 PC	1
23	5043-09443	C2,C4,C6	CAPACITOR, 0.1 MFD, 200V, DISC	3
24	5040-09421	C7	CAPACITOR, 100 MFD, 25V, RADIAL	1
25	5164-09057	Q1	TRANSISTOR, SDS 201 NPN	1
26	5164-09056	Q4	TRANSISTOR, MPS D02 NPN	1
27	5194-09058	Q3	TRANSISTOR, SDS 202 PNP	1
28	5194-09055	Q2	TRANSISTOR, MPS D52 PNP	1
29	5705-04431		HEAT SINK	
30	5791-09067	3J5	CONNECTOR, 6 PIN (H)	1
31	5791-09074	3J6	CONNECTOR, 15 PIN (H)	1
32	5791-09027	3J8, 3J3	CONNECTOR, 9 PIN (H)	2
33	5791-09038	3J2	CONNECTOR, 6 PIN (H)	1
34	5162-09425	Q5	TRANSISTOR, POWER, 2N6087 NPN	
35	5791-09043	3J4	CONNECTOR, 12 PIN (H)	1
36	5791-09435	3J7	CONNECTOR, 3 PIN (H)	1
37	5791-09436	3J9	CONNECTOR, 2 PIN (H)	1
38	5791-09068	3J1	CONNECTOR, 12 PIN	1
39	5732-09178		FUSE HOLDER	14
40	5731-09128	F2	FUSE, 2-1/2 AMP, S.B.	1
41	5730-09071	F3	FUSE, 8 AMP	
42		F4	NOT USED	
43			NOT USED	
44	5731-08761	F1	FUSE, 20 AMP	1
45	5017-09061	VR1	VARISTOR	1
47A	5700-09445		SOCKET	
47B	5701-09538		MICA INSULATOR	
47	5580-09555	K1	RELAY, 24 VDC, 10 AMP, DPDT	1
48	5824-09248		TERMINAL, #1502-1 (TEST POST)	3
49	5100-09418	BR-1	BRIDGE RECTIFIER, 35 AMP, 100V	1
50	5705-09042		HEAT SINK	2
51	3A-7520-1		TIE WRAP	1
52	4005-01016-07		5-40 x 7/16 R.H. MECH. SCREW	2
53	4405-01117		5-40 HEX NUT	2
54		W1, W2	JUMPER, #18 AWG	2
55	5040-09422	C8	CAPACITOR, 47 MFD, 50V, RADIAL	1
56	20-9229		THERMAL COMPOUND	
57			LEAD WIRE, #18 AWG (3")	3
58	5731-09432	F6, F5	FUSE, 7A, S.B., 250V	2


DISPLAY 90 VAC
100VDC 70MA
LOGIC GROUND
-100VDC 70MA
+5VDC
LAMP GROUND
LAMP +18VDC
LOGIC GROUND
SOLENOID B+ 28VDC
SOLENOID GROUND
5VDC REG. SB
5 VDC REG. 5 AMPS
LOGIC GROUND
12VDC UNREG.
12VDC UNREG.
13VDC UNREG.
GENERAL ILLUMINATION (FLIPPER)
BRIDGE RECTIFIER 35 AMP


POWER WIRING
7T1
9 WHT
90V.A.C.
10 WHT
15 GRY
9.3V.A.C.
18 GRY-WHT
9.3V.A.C
16 GRY-GRN
P/O 6P1
P/O 6J1
11 BLU
13.5V.A.C.
12 BLU
13 RED
25.5V.A.C.
14 RED
17 YEL
6.3V.A.C.
19 YEL
7P4
7J4
WHT-RED
NC
ON-OFF SWITCH
A.C. FUSE
BLK
VR1
WHT
GRN
LINE PLUG
UTILITY OUTLET
LINE
LF1 LINE FILTER
LOAD
7P3
7J3
YEL
BLK-WHT
BRN-WHT
7P5
7J5
WHT-BLK
WHT-BRN
15P4
15J4
N.C.
10 WHT-GRN
48Vrms
9 WHT-ORN
48Vrms
KEY
F2
5ASB
BR1
FLIPPER POWER


10P1
SOUND BOARD SUPPLY 18.7 V.A.C. C.T.
3P1
3J1
F1 0.25ASB
+100V.D.C. -100V.D.C. SUPPLIES
+100V.D.C.
-100V.D.C.
3J5
3P5
4P7
BRN
ORN, WHT-BLK
GRY
BLK
MASTER DISPLAY
F5 7ASB
+5V.D.C. +12V.D.C. -12V.D.C. SUPPLIES
+5V.D.C.
+12V.D.C.
-12V.D.C.
F6 7ASB
LAMP RECTIFIER
A.C.
6BR1
P/O 6J1
P/O 6P1
V10
6C1
30,000µF
ORN
N.C.
3J3
3P3
NC
8P3
35 SPEC. SW. GND
36 SOL. B+
PLAYFIELD
F3 8ASB
+18V.D.C.
RED
7P1
3 SOL. B+ CABINET
F2 2.5ASB
SOLENOID B+
+28VDC
9P1
6BR2
3P2
3J2
3J4
3P4
BLU
BLK
2P4
+16V.D.C. LAMP B+ DRIVER BOARD
KEY
2P6
LAMP GROUND DRIVER BOARD
3P9
3J9
3J6
3P6
GRY
GRY-WHT
2P8
GROUND DRIVER BOARD
+5V.D.C. DRIVER BOARD
2P10
SOLENOID GROUND DRIVER BOARD
3P7
3J7
DRIVER BOARD SOL. 11 (Q35)
BRN-ORN
K1 SPECIAL RELAY
1P2
GROUND
+5V.D.C.
CPU BOARD
+12V.D.C. UNREG.
POWER SUPPLY BOARD
3J8
3P8
ALL 5A S.B.
WHT-VIO
WHT-YEL
WHT-BRN
WHT-GRN
YEL
VIO
GRN
BRN
8J8
8P8
8P5
15P2
15J2
BLK
15J3
15P3
+50VDC
W1
C1 100
C3 0.1
8P2
FLIPPER B+ PLAYFIELD
R SUPPLY



SOUND BOARD JUMPERS

JUMPERS USED	TOM TYPE	FORMAT	GAMES USED IN
W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound & Speech	Gorgar, Blackout, Firepower, Black Knight, Jungle Lord, Pharaoh.
W1, W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound Only	Defender Video & Pin, Solar Fire, Barracora, Hyperball, Stargate, Cosmic Gunfight, Varkon, Time Fantasy.
W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound & Speech	Sinistar (Upright & Cockpit Front)
W1, W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound Only	Robotron, Joust Video & Pin, Bubbles, Sinistar (Cockpit Rear)
W1, W2, W4, W5, W7, W10, W15	2K x 8 2516, 2716	Sound Only	Warlock
W1, W3, W6, W7, W9 W11, W12, W15	512 x 8 7641	Sound Only	Big Strike

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TDA 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	IN5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00)	BR1	MDA 200/3N253	1
	5100-09158-00)		BRIDGE RECTIFIER	0
18	5520-09020-00	Y1	3.58 MHz CRYSTAL	1
19	5010-08991-00	R1,R18,R19,R21,R22, R27,R30,R31, R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
20	5010-09036-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	9
21	5010-09358-00	R12,R15,R28,R36,R38	RESISTOR, FC, 1K OHM, 5% 1/4W	5
22	5010-09181-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
23	5010-09161-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
24	5010-09361-00	R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
25				
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 3.3K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 3.3M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER. .01 MFD. 50V. +80%, -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER. 470 PFD. 50V. +-20%	9
33	5043-09345-00	C11	CAPACITOR, CER. .001 MFD. +-20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER. .1 MFD. 50V. +-20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +-20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. 470 MFD. 10V. +-20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +-20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +-20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +-20%	1
41	5043-09180-00	C28	CAPACITOR, CER. 47 PFD. 1K V. +-20%	1
42	5040-09343-00)	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC, 27 PFD. 1KV. +-10%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +-20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +-20%	1
46	5641-09658-00)	SW1	MOMENTARY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09178-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.

2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.

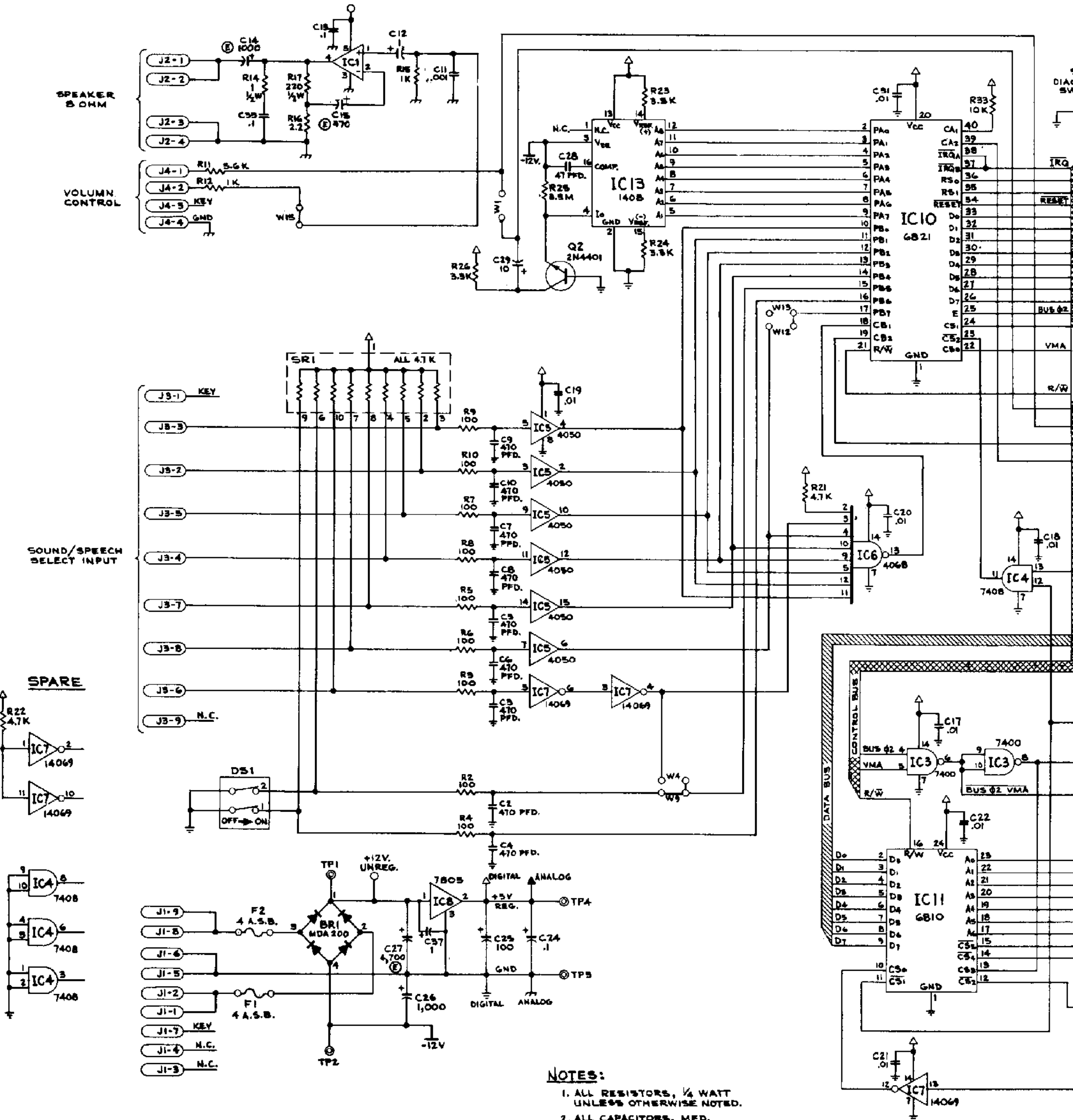
3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY.
   DO NOT SCREEN OR STAMP.

4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

   DIODES D1, D2, AND ZR1;

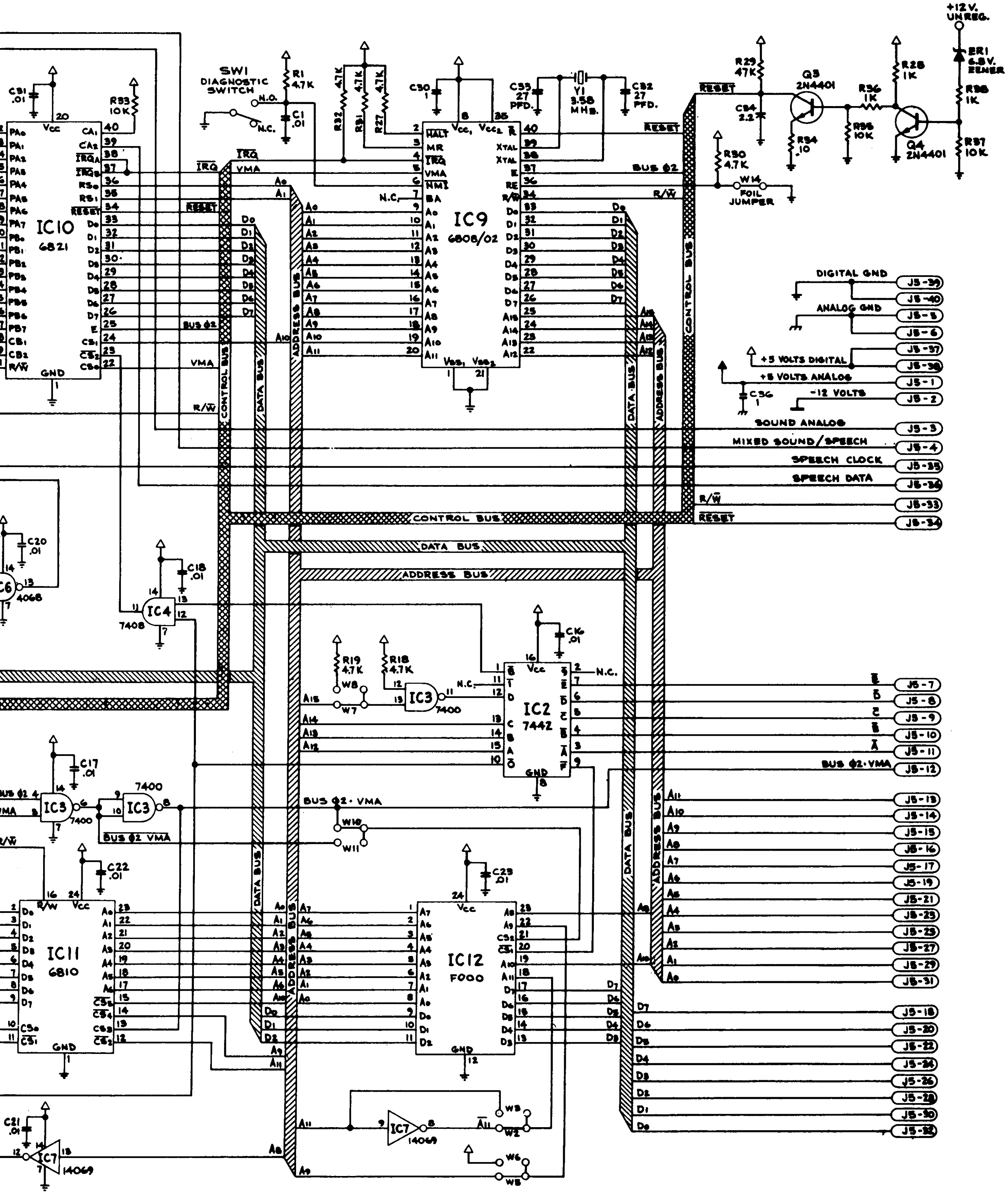
   CAPACITORS C12, C14, C15, C25, C26, C27;

   CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5;



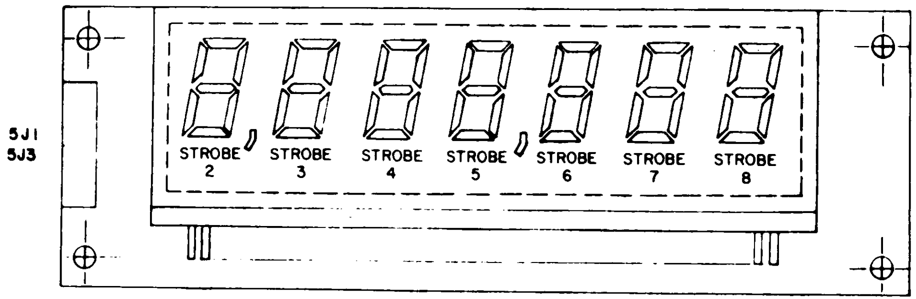
NOTES:

1. ALL RESISTORS, ¼ WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.

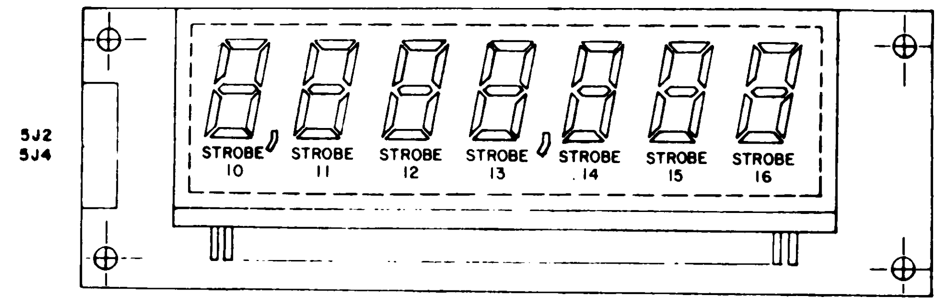


Sound Board Logic Diagram

PLAYERS #1 AND 3

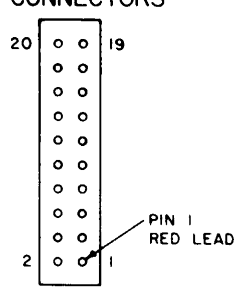


PLAYERS #2 AND 4



DETAIL A

4J1 – 4J4, 4J8
5J1 – 5J5
CONNECTORS



4J1/5J1 (PLAYER 1)

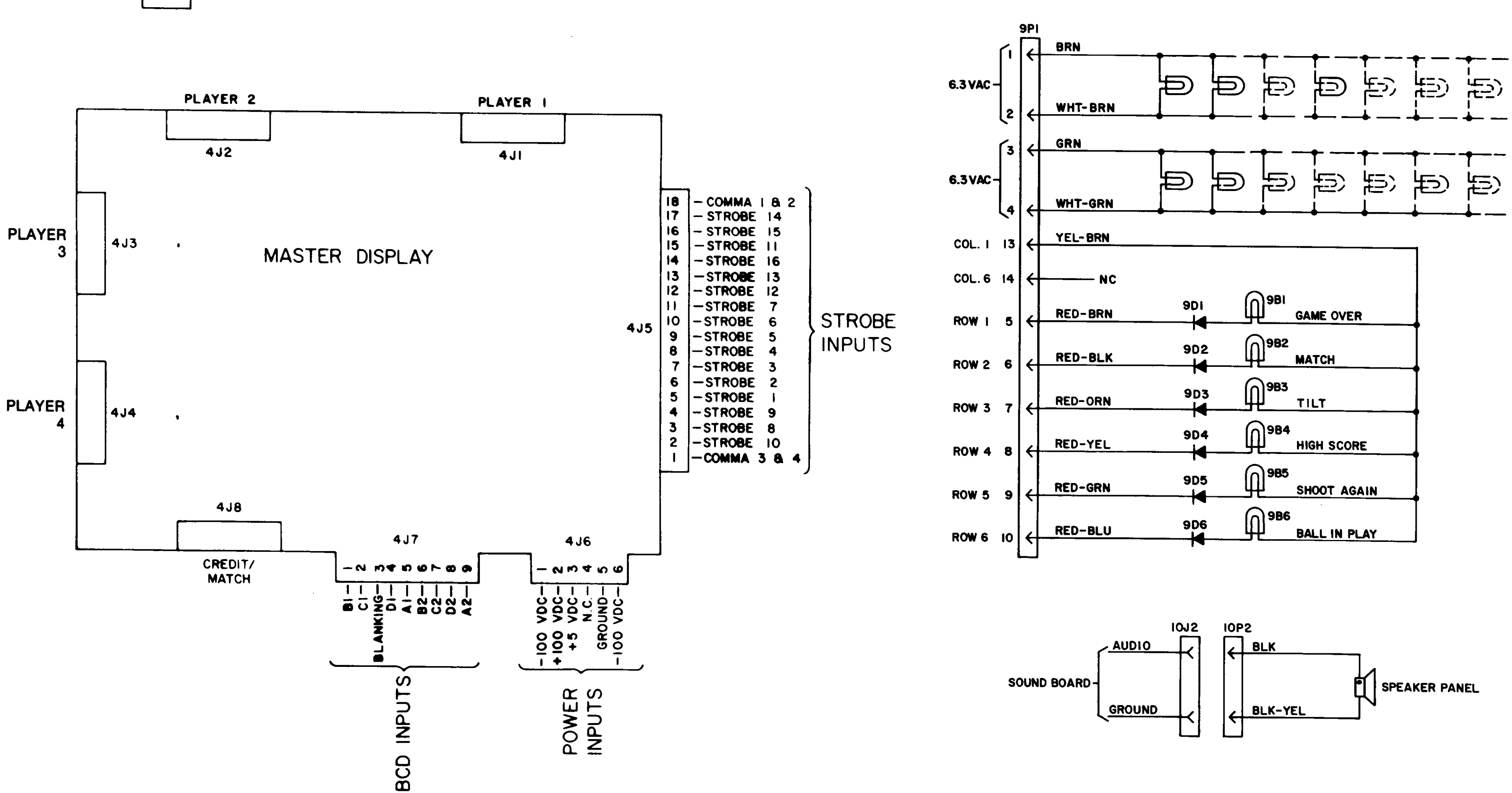
1	100,000's
2	-100V KEEP ALIVE
3	1,000,000's
4	f SEGMENT
5	N/C
6	g SEGMENT
7	+100V (N/C)
8	e SEGMENT
9	10,000's
10	d SEGMENT
11	1,000's
12	+100V KEEP ALIVE
13	100's
14	COMMA
15	10's
16	c SEGMENT
17	N/C
18	b SEGMENT
19	UNITS
20	a SEGMENT

4J2/5J2 (PLAYER 2)

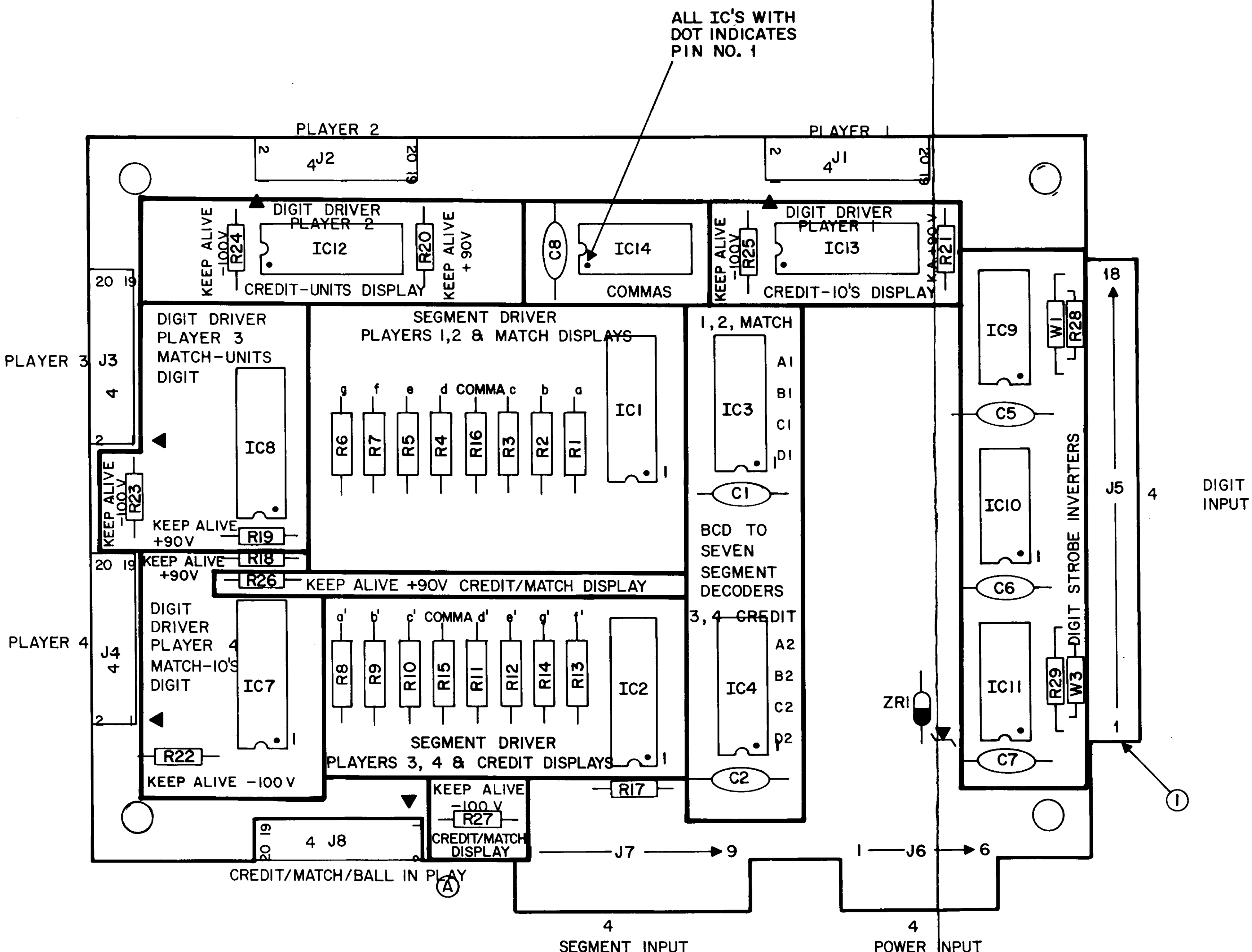
1	100,000's
2	-100V KEEP ALIVE
3	1,000,000's
4	f' SEGMENT
5	N/C
6	g' SEGMENT
7	+100V (N/C)
8	e' SEGMENT
9	10,000's
10	d' SEGMENT
11	1,000's
12	+100V KEEP ALIVE
13	100's
14	COMMA
15	10's
16	c' SEGMENT
17	N/C
18	b' SEGMENT
19	UNITS
20	a' SEGMENT

4J8/5J5 (CREDIT/MATCH)

1	f' Segment (Credit)	
2	-100V Keep Alive	
3	e' Segment	Credit
4	g' Segment	Credit
5	c' Segment	Credit
6	d' Segment	Credit
7	b' Segment	Credit
8	10's	Credit
9	Units	Credit
10	a' Segment	Credit
11	e Segment	Match
12	f Segment	Match
13	10's	Match
14	d Segment	Match
15	+100V Keep Alive	
16	c Segment	Match
17	g Segment	Match
18	b Segment	Match
19	Units	Match
20	a Segment	Match



MASTER DISPLAY
PLAYER 1
4J1
PLAYER 2
4J2
PLAYER 3
4J3
PLAYER 4
4J4
4J5
18 – COMMA 1 & 2
17 – STROBE 14
16 – STROBE 15
15 – STROBE 11
14 – STROBE 16
13 – STROBE 13
12 – STROBE 12
11 – STROBE 7
10 – STROBE 6
9 – STROBE 5
8 – STROBE 4
7 – STROBE 3
6 – STROBE 2
5 – STROBE 1
4 – STROBE 9
3 – STROBE 8
2 – STROBE 10
1 – COMMA 3 & 4
STROBE INPUTS
4J8
CREDIT/ MATCH
4J7
1 – B1
2 – C1
3 – BLANKING
4 – D1
5 – A1
6 – B2
7 – C2
8 – D2
9 – A2
BCD INPUTS
4J6
1 – -100 VDC
2 – +100 VDC
3 – +5 VDC
4 – N.C.
5 – GROUND
6 – -100 VDC
POWER INPUTS
9P1
6.3VAC
1 BRN
2 WHT-BRN
6.3VAC
3 GRN
4 WHT-GRN
COL. 1 13 YEL-BRN
COL. 6 14 NC
ROW 1 5 RED-BRN 9D1 9B1 GAME OVER
ROW 2 6 RED-BLK 9D2 9B2 MATCH
ROW 3 7 RED-ORN 9D3 9B3 TILT
ROW 4 8 RED-YEL 9D4 9B4 HIGH SCORE
ROW 5 9 RED-GRN 9D5 9B5 SHOOT AGAIN
ROW 6 10 RED-BLU 9D6 9B6 BALL IN PLAY
SOUND BOARD
AUDIO
GROUND
10J2
10P2
BLK
BLK-YEL
SPEAKER PANEL



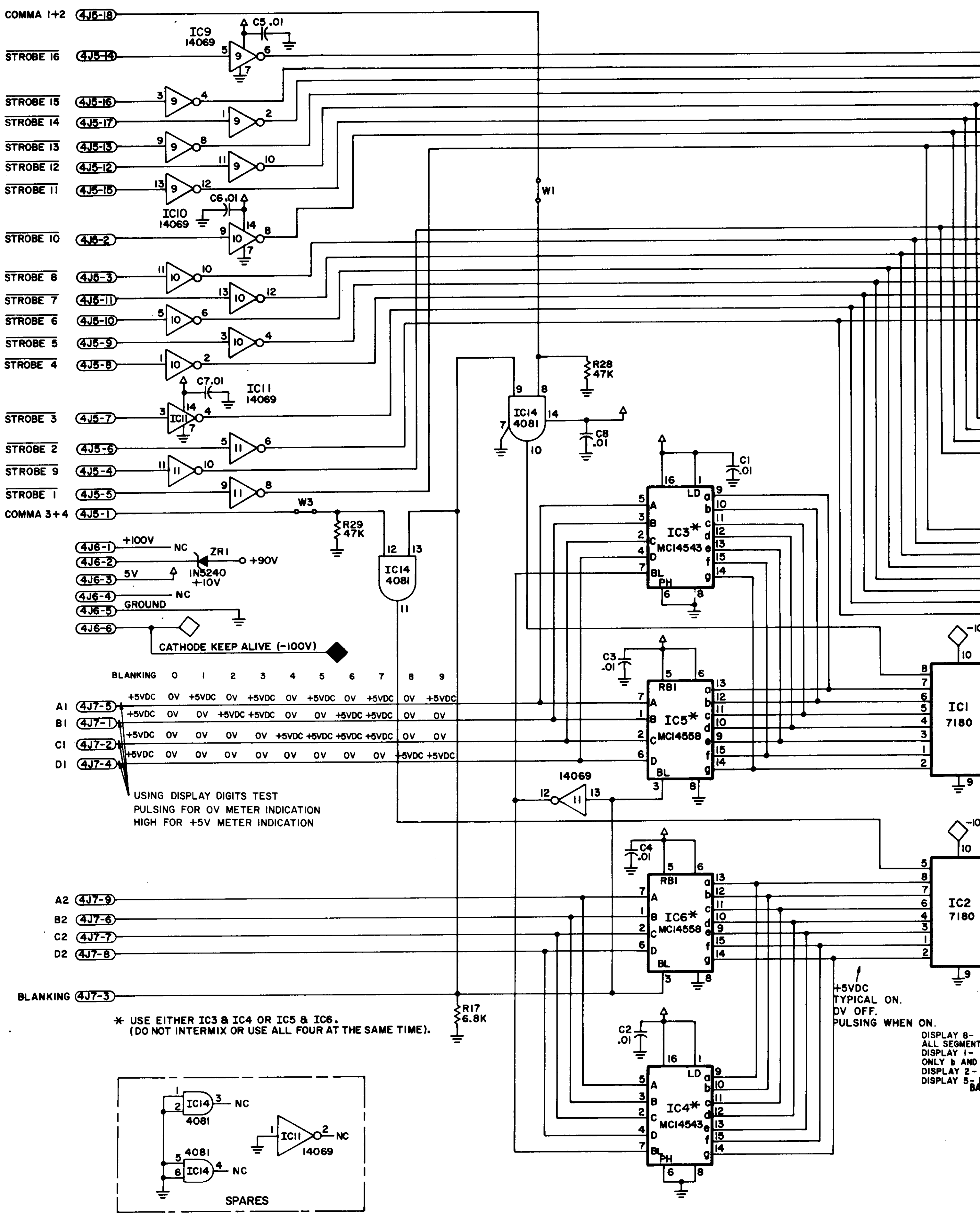
ALL IC'S WITH DOT INDICATES PIN NO. 1
PLAYER 2
J2
PLAYER 1
J1
PLAYER 3
J3
PLAYER 4
J4
DIGIT DRIVER PLAYER 2
IC12
KEEP ALIVE -100V
R24
R20
KEEP ALIVE +90V
CREDIT-UNITS DISPLAY
C8
IC14
COMMAS
DIGIT DRIVER PLAYER 1
IC13
KEEP ALIVE -100V
R25
K.A.+90V
R21
CREDIT-10'S DISPLAY
DIGIT DRIVER PLAYER 3 MATCH-UNITS DIGIT
IC8
KEEP ALIVE -100V
R23
KEEP ALIVE +90V
R19
R18
R26
KEEP ALIVE +90V CREDIT/MATCH DISPLAY
SEGMENT DRIVER PLAYERS 1,2 & MATCH DISPLAYS
g f e d COMMA c b a
R6 R7 R5 R4 R16 R3 R2 R1
IC1
1,2, MATCH
IC3
A1 B1 C1 D1
C1
BCD TO SEVEN SEGMENT DECODERS
3, 4 CREDIT
IC4
A2 B2 C2 D2
C2
IC9
IC10
IC11
W1 R28
C5 C6 C7
DIGIT STROBE INVERTERS
R29 W3
J5
18
4
DIGIT INPUT
DIGIT DRIVER PLAYER 4 MATCH-10'S DIGIT
IC7
R22
KEEP ALIVE -100V
a' b' c' COMMA d' e' g' f'
R8 R9 R10 R15 R11 R12 R14 R13
IC2
SEGMENT DRIVER PLAYERS 3, 4 & CREDIT DISPLAYS
R17
ZR1
KEEP ALIVE -100 V
R27
CREDIT/MATCH DISPLAY
J8
CREDIT/MATCH/BALL IN PLAY
A
J7
9
SEGMENT INPUT
J6
6
POWER INPUT

BILL OF MATERIAL

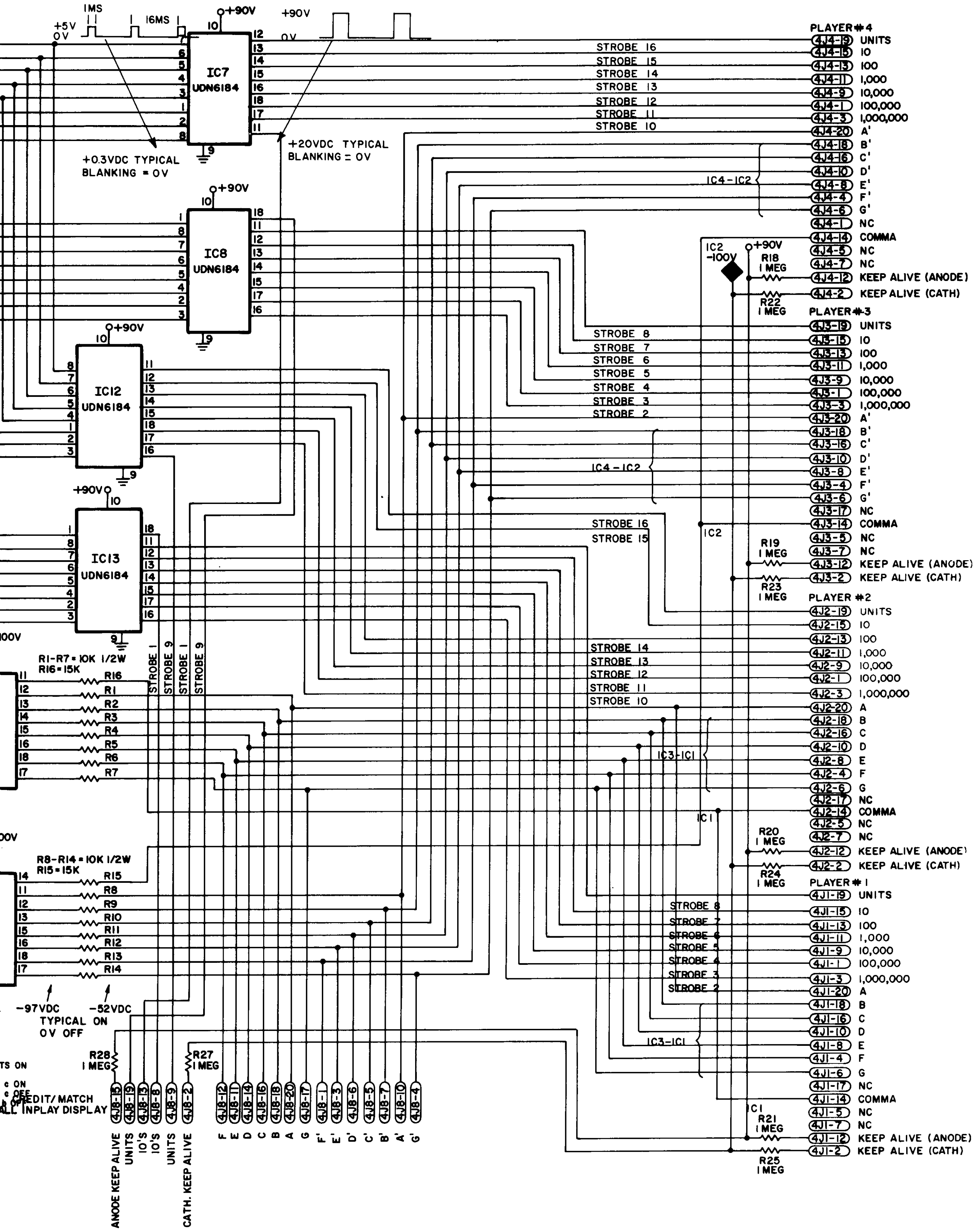
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5760-09461		BARE P.C. BOARD	1
2	5310-08971	IC9,IC10,IC11	MC14069 HEX INVERTER	3
3	5310-08970	IC3, IC4	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
4	5680-08969	IC1, IC2	UDN-7180 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
5	5680-08968	IC7,IC8,IC12,IC13	UDN-6184A OR UDN-6118A GAS DISCHARGE DISPLAY SEGMENT DR.	4
6	5310-09450	IC14	MC14081 QUAD 2-INPUT AND GATE	1
7	5010-08981	R1-R14	RESISTOR,FC,10K OHM, 5%, 1/2 WATT	14
8	5075-09135	~~Z~~R1	IN4740A ZENER DIODE 10V, 5%, 1 WATT	1
9	5043-08980	C1,C2 C5 THRU C8	CAPACITOR, CERAMIC, 0.01 MFD., 50V, +80 -20%	6
10	5010-09035	R28, R29	RESISTOR, FC,47K OHM, 5%, 1/4 WATT	2
11	5010-09086	R17	RESISTOR, FC, 6.8K OHM, 5%, 1/4 WATT	1
12	5010-08982	R18 THRU R27	RESISTOR, FC, 3 MEG. OHM, 5%, 1/4 WATT	10
13	5791-09437	J1 THRU J4, J8	20 PIN RIBBON HEADER	5
14	5010-09149	R15, R16	RESISTOR, FC, 15K OHM, 5%, 1/2 WATT	2
15	5010-09534	W1, W3	RESISTOR, 0 OHM	2

DIGIT CROSS REFERENCE

DIGIT	7-SEGMENT DECODER/DRIVER	STROBE (DRIVER)
Credit 10's	IC4/IC2	1 (IC13)
Credit Units	IC4/IC2	9 (IC12)
Match 10's	IC3/IC1	1 (IC7)
Match Units	IC3/IC1	9 (IC8)
#1 1,000,000	IC3/IC1	2 (IC13)
#1 100,000's	IC3/IC1	3 (IC13)
#1 10,000's	IC3/IC1	4 (IC13)
#1 1,000's	IC3/IC1	5 (IC13)
#1 100's	IC3/IC1	6 (IC13)
#1 10's	IC3/IC1	7 (IC13)
#1 Units	IC3/IC1	8 (IC13)
#2 1,000,000's	IC3/IC1	10 (IC12)
#2 100,000's	IC3/IC1	11 (IC12)
#2 10,000's	IC3/IC1	12 (IC12)
#2 1,000's	IC3/IC1	13 (IC12)
#2 100's	IC3/IC1	14 (IC12)
#2 10's	IC3/IC1	15 (IC12)
#2 Units	IC3/IC1	16 (IC12)
#3 1,000,000's	IC4/IC2	2 (IC8)
#3 100,000's	IC4/IC2	3 (IC8)
#3 10,000's	IC4/IC2	4 (IC8)
#3 1,000's	IC4/IC2	5 (IC8)
#3 100's	IC4/IC2	6 (IC8)
#3 10's	IC4/IC2	7 (IC8)
#3 Units	IC4/IC2	8 (IC8)
#4 1,000,000's	IC4/IC2	10 (IC7)
#4 100,000's	IC4/IC2	11 (IC7)
#4 10,000's	IC4/IC2	12 (IC7)
#4 1,000's	IC4/IC2	13 (IC7)
#4 100's	IC4/IC2	14 (IC7)
#4 10's	IC4/IC2	15 (IC7)
#4 Units	IC4/IC2	16 (IC7)
#1 Comma	-/IC1	2,5 (IC13)
#2 Comma	-/IC2	10,13 (IC12)
#3 Comma	-/IC1	2,5 (IC8)
#4 Comma	-/IC2	10,13 (IC7)

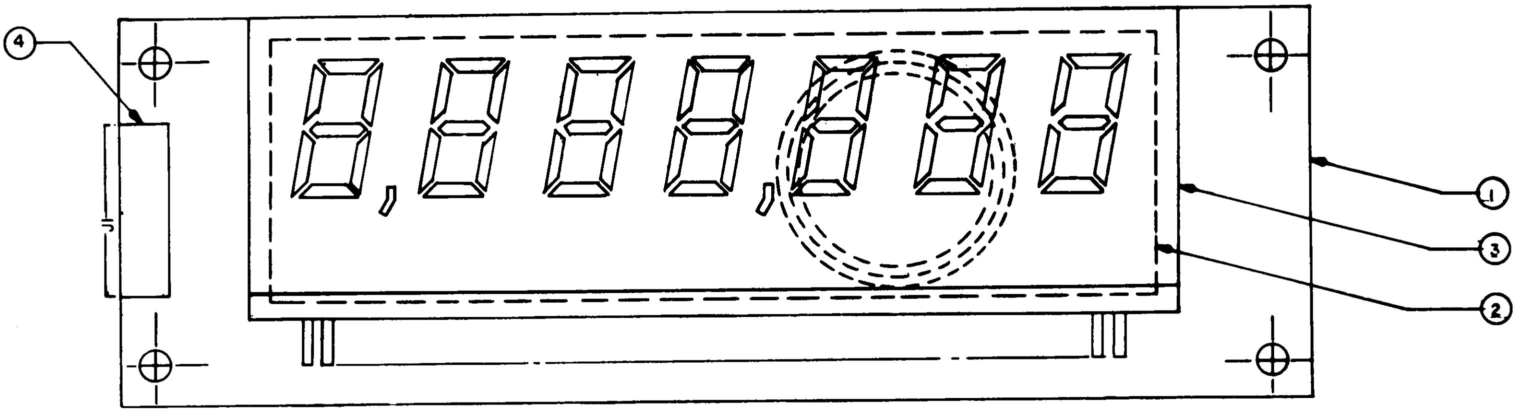


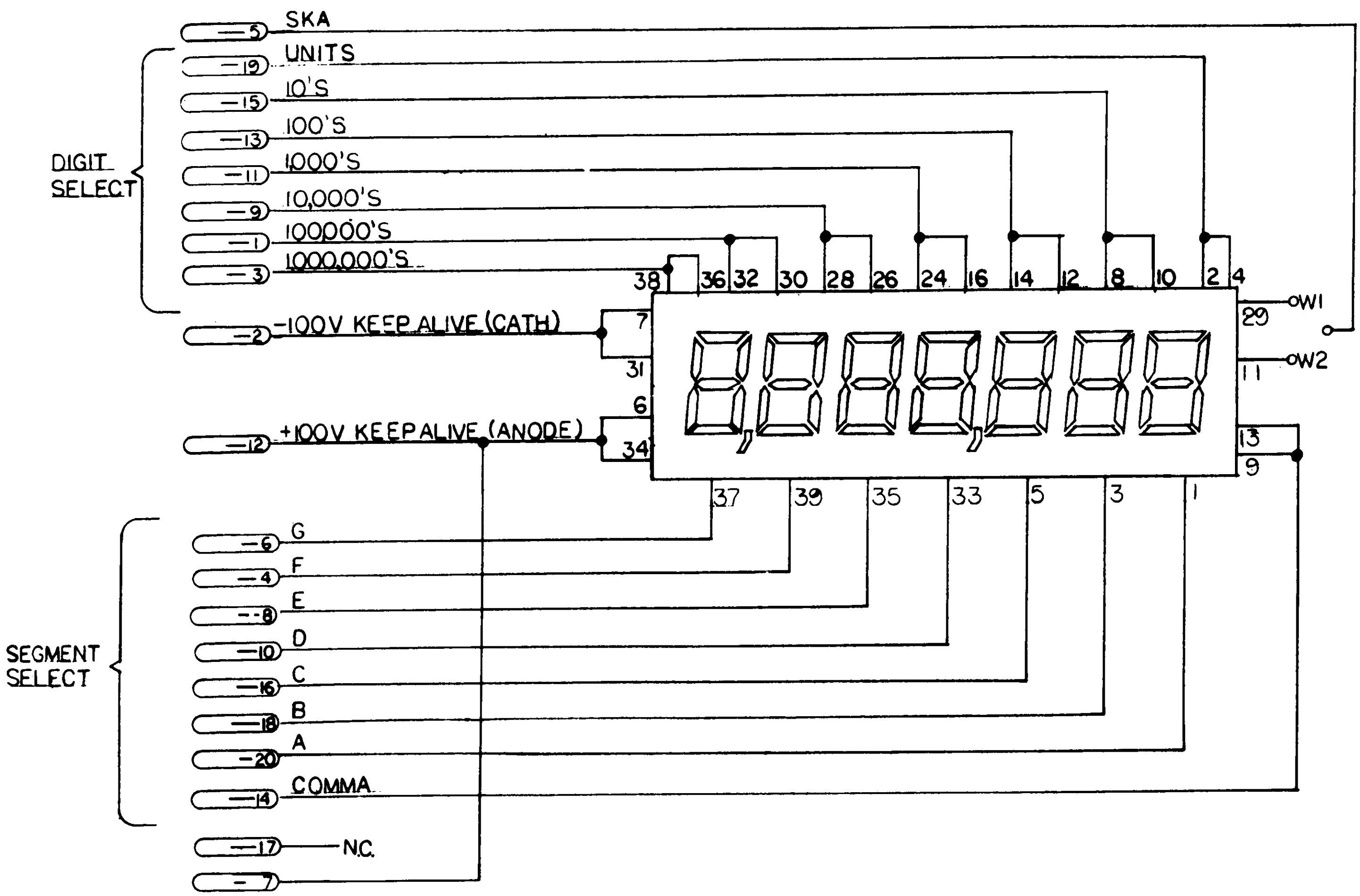
COMMA 1+2 4J5-18
STROBE 16 4J5-14
STROBE 15 4J5-16
STROBE 14 4J5-17
STROBE 13 4J5-13
STROBE 12 4J5-12
STROBE 11 4J5-15
STROBE 10 4J6-2
STROBE 8 4J5-3
STROBE 7 4J5-11
STROBE 6 4J5-10
STROBE 5 4J5-9
STROBE 4 4J5-8
STROBE 3 4J5-7
STROBE 2 4J5-6
STROBE 9 4J5-4
STROBE 1 4J5-5
COMMA 3+4 4J5-1
IC9 14069
C5 .01
IC10 14069
C6 .01
IC11 14069
C7 .01
W1
W3
R28 47K
R29 47K
IC14 4081
C8 .01
4J6-1 +100V NC
4J6-2 ZR1 +90V
4J6-3 5V
1N5240 +10V
4J6-4 NC
4J6-5 GROUND
4J6-6
CATHODE KEEP ALIVE (-100V)
BLANKING 0 1 2 3 4 5 6 7 8 9
A1 4J7-5 +5VDC 0V +5VDC 0V +5VDC 0V +5VDC 0V +5VDC 0V +5VDC
B1 4J7-1 +5VDC 0V 0V +5VDC +5VDC 0V 0V +5VDC +5VDC 0V 0V
C1 4J7-2 +5VDC 0V 0V 0V 0V +5VDC +5VDC +5VDC +5VDC 0V 0V
D1 4J7-4 +5VDC 0V 0V 0V 0V 0V 0V 0V 0V +5VDC +5VDC
USING DISPLAY DIGITS TEST
PULSING FOR 0V METER INDICATION
HIGH FOR +5V METER INDICATION
IC3* MC14543
C1 .01
IC5* MC14558
C3 .01
14069
IC6* MC14558
C4 .01
IC4* MC14543
C2 .01
IC1 7180
IC2 7180
A2 4J7-9
B2 4J7-6
C2 4J7-7
D2 4J7-8
BLANKING 4J7-3
R17 6.8K
+5VDC TYPICAL ON.
0V OFF.
PULSING WHEN ON.
DISPLAY 8-
ALL SEGMENT
DISPLAY 1-
ONLY b AND
DISPLAY 2-
DISPLAY 5-
* USE EITHER IC3 & IC4 OR IC5 & IC6.
(DO NOT INTERMIX OR USE ALL FOUR AT THE SAME TIME).
IC14 4081 NC
IC11 14069 NC
SPARES



C 8363 Master Display Board Logic Diagram

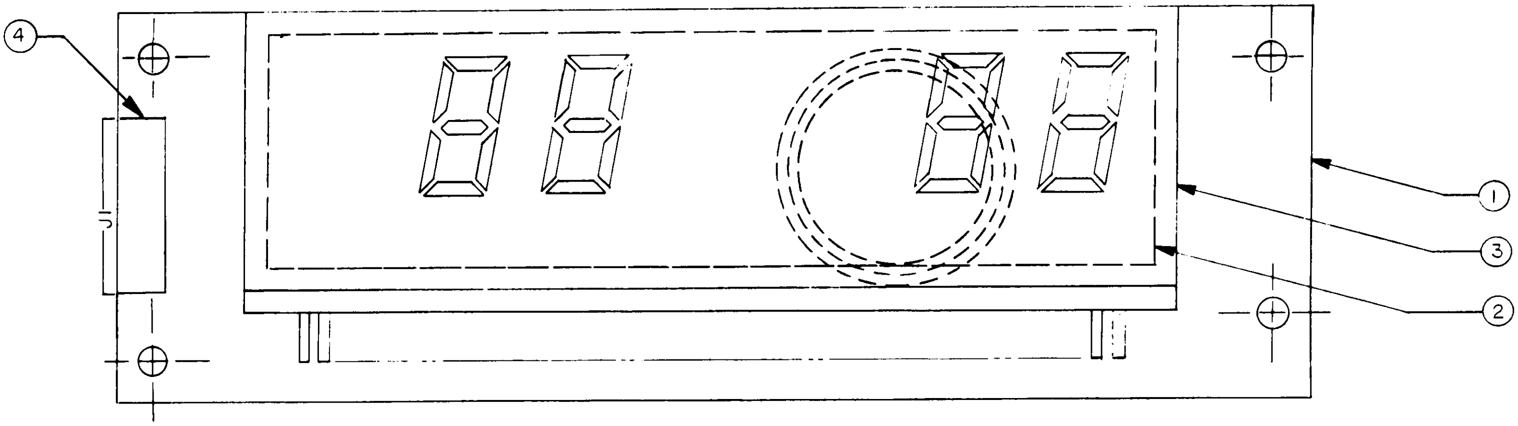
BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D.
1	5762-08408-XP		SLAVE DISPLAY P.C. BOARD	1
2	23-6545		DISPLAY MTG ADHESIVE FOAM	1
3	5670-08428-XP		7 DIGIT DISPLAY	1
4	5791-08428-XP	J1	20 PIN RIBBON HEADER	1
5	03-7572-2		CAPLUG	1

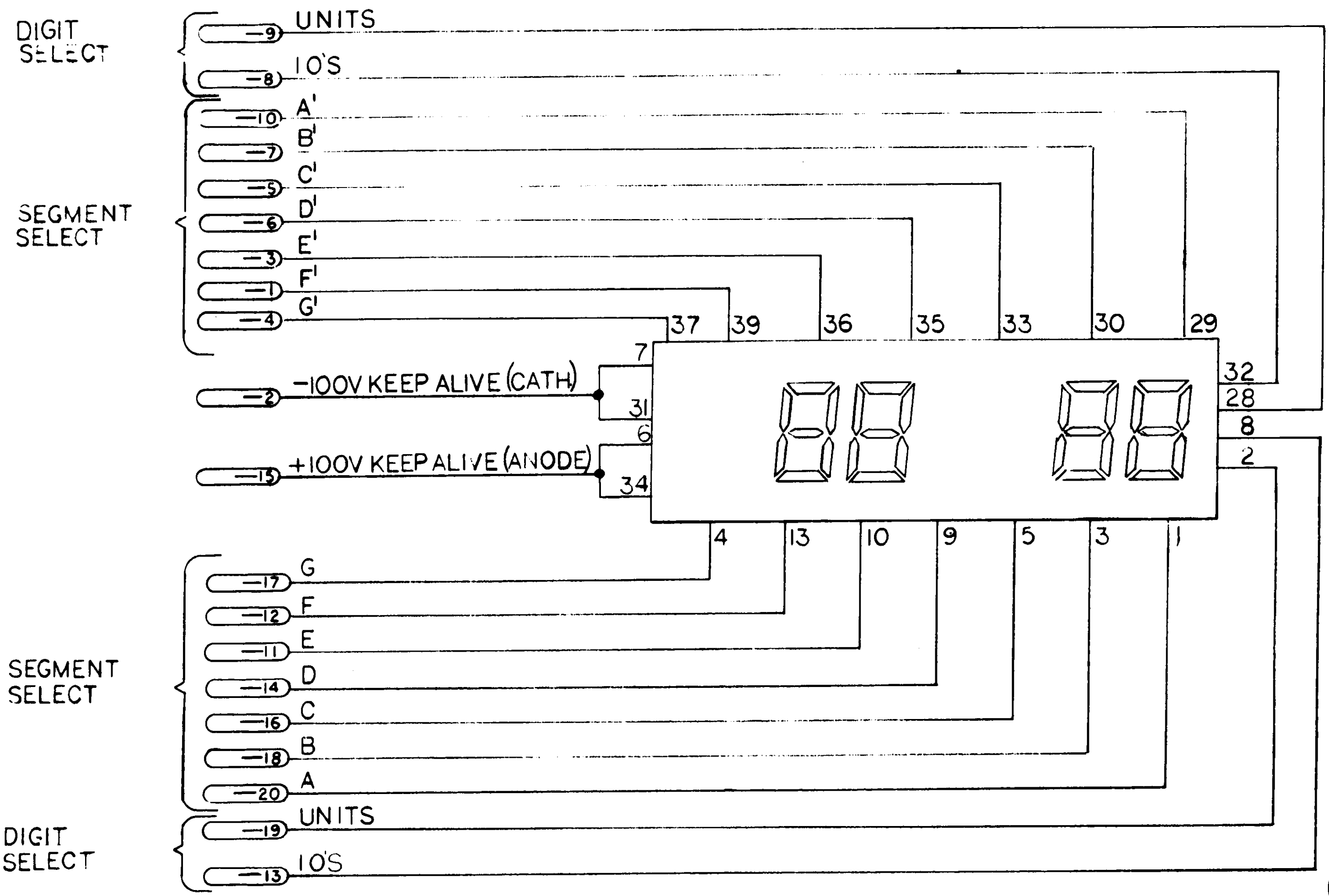




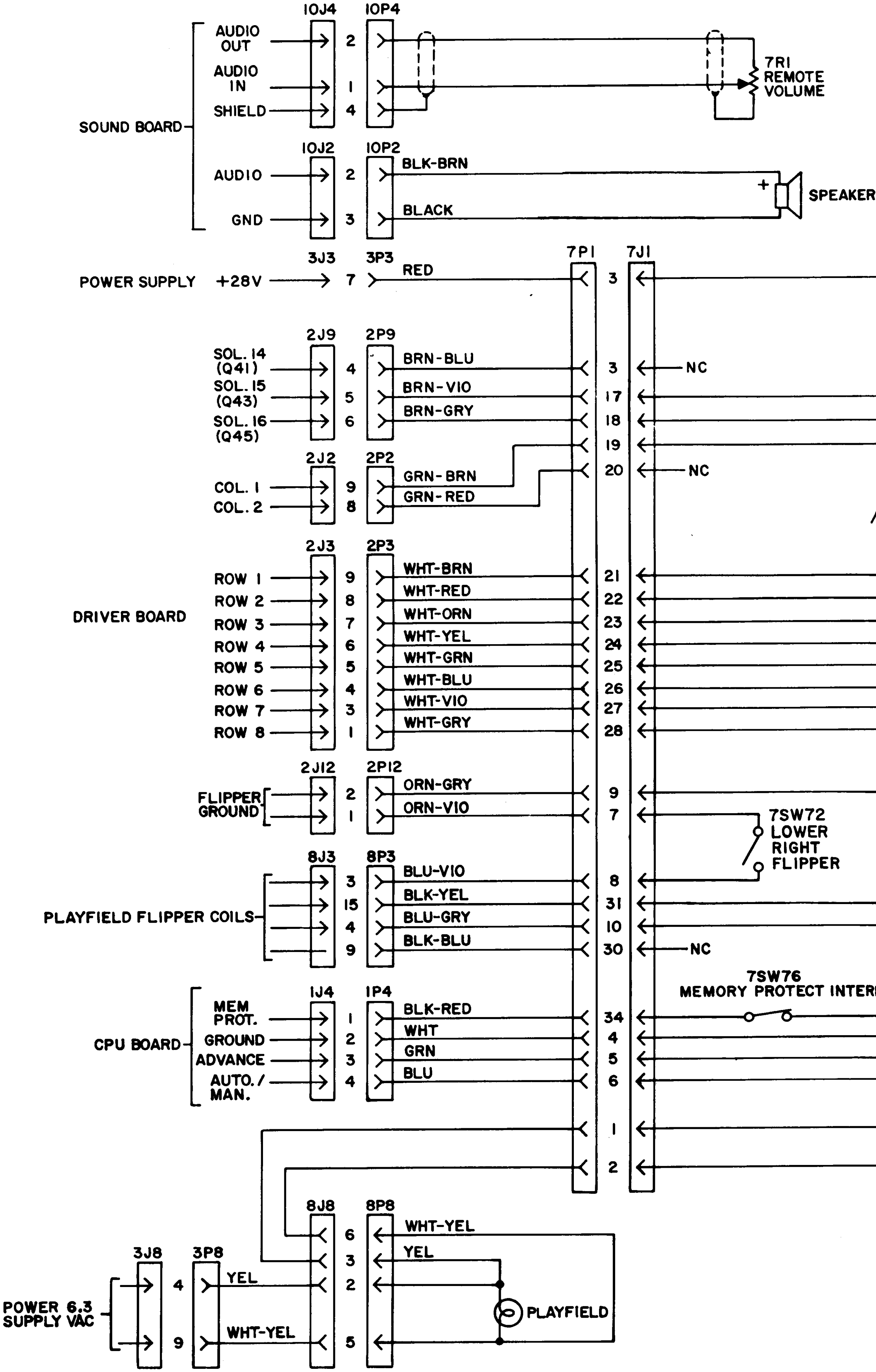
C 8364 PLAYER SLAVE DISPLAY

BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ' D
1	5767-09468-00		CREDIT/MATCH SLAVE P.C. BOARD	1
2	23-6548 -		FOAM DISPLAY - BACK	1
3	5670-09448-00		4 DIGIT DISPLAY	1
4	5791-09438-00	J1	20 PIN RIBBON HEADER	1
5	23-6546		FOAM DISPLAY - FRONT	1
6	03-7573-2		CAPLUG	1

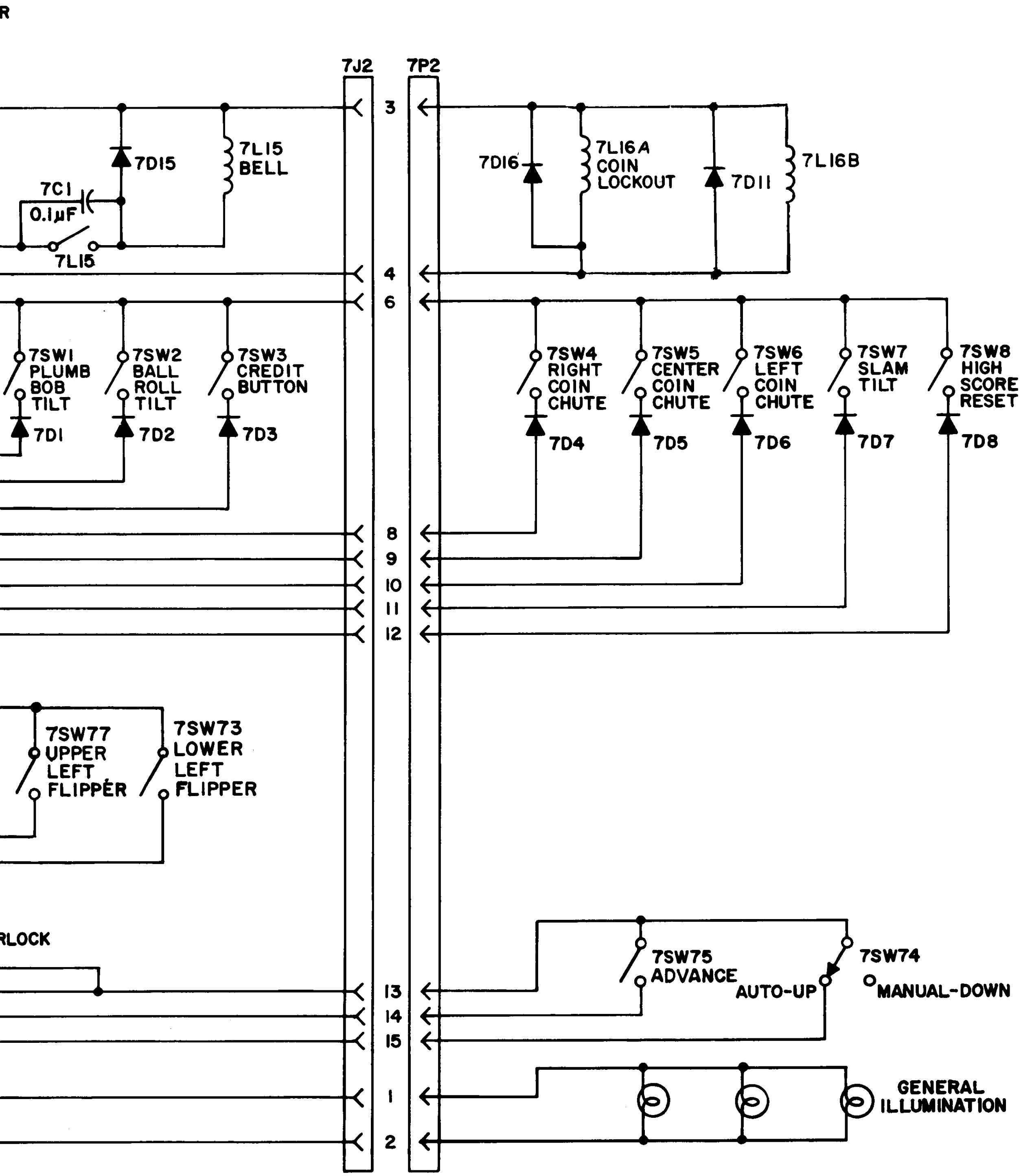


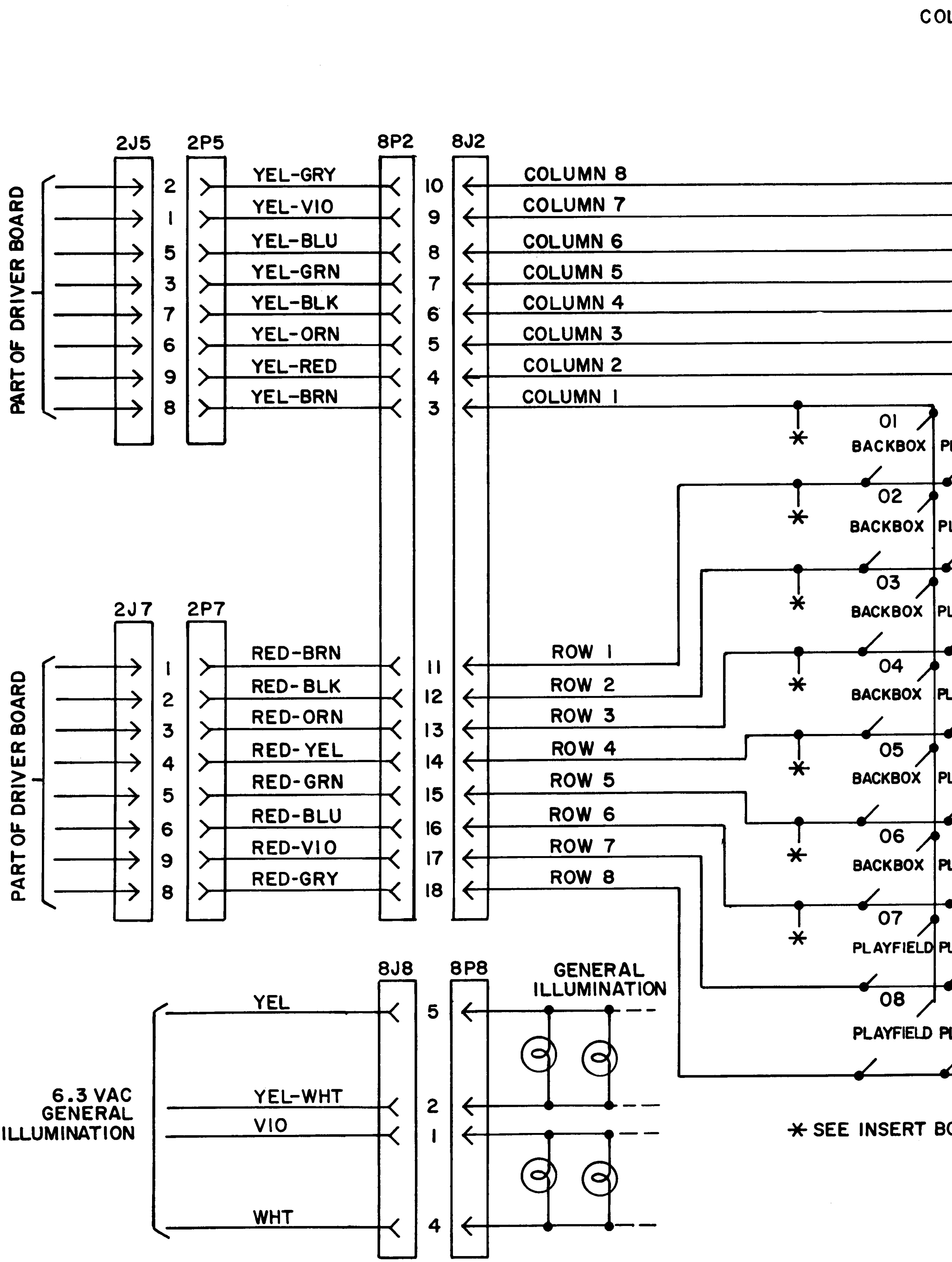


C 8365 CREDIT/MATCH SLAVE DISPLAY

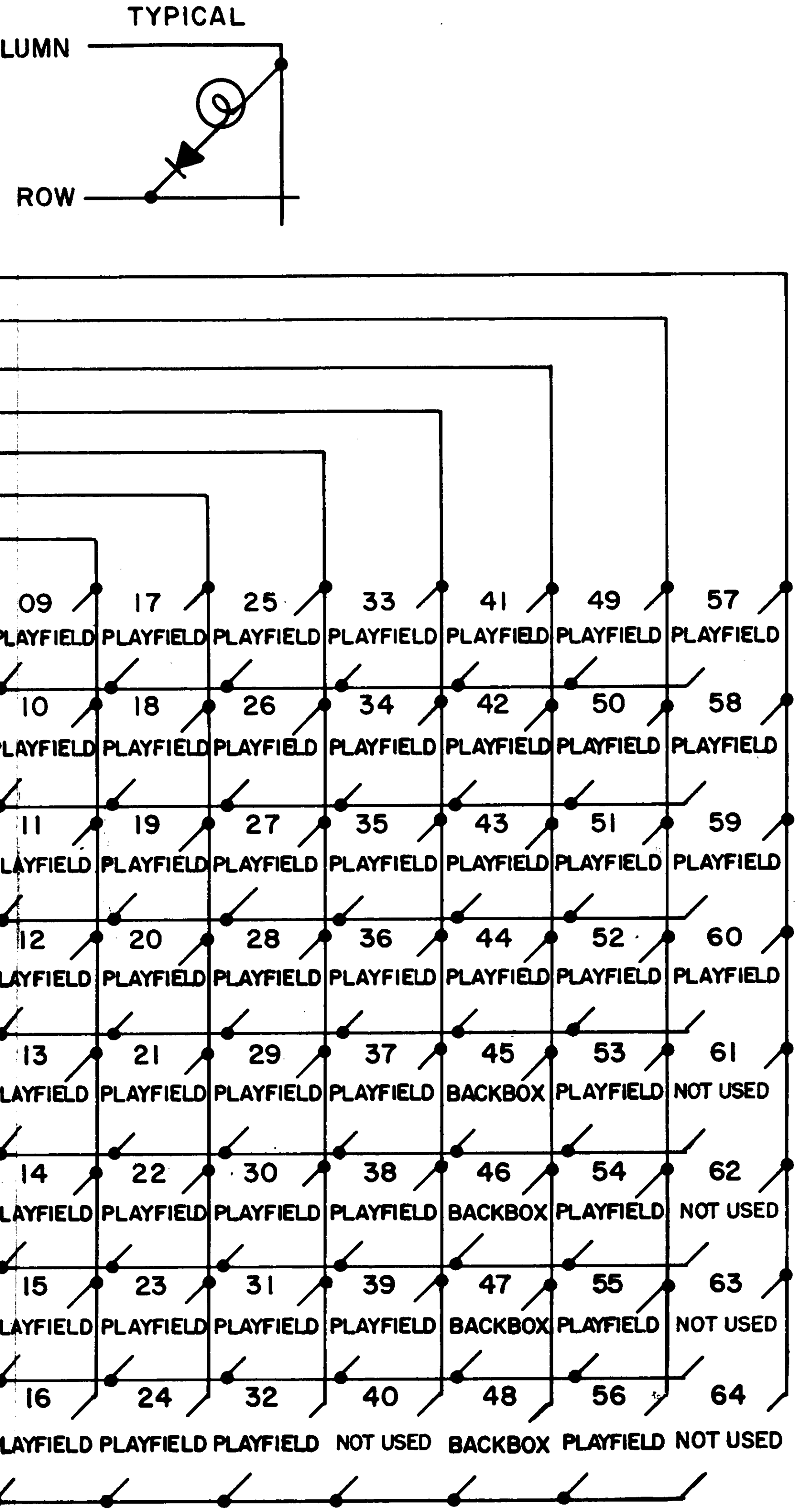


SOUND BOARD
10J4
10P4
AUDIO OUT
AUDIO IN
SHIELD
7R1 REMOTE VOLUME
10J2
10P2
AUDIO
GND
BLK-BRN
BLACK
SPEAKER
POWER SUPPLY +28V
3J3
3P3
RED
7P1
7J1
2J9
2P9
SOL. 14 (Q41)
SOL. 15 (Q43)
SOL. 16 (Q45)
BRN-BLU
BRN-VIO
BRN-GRY
NC
2J2
2P2
COL. 1
COL. 2
GRN-BRN
GRN-RED
2J3
2P3
DRIVER BOARD
ROW 1
ROW 2
ROW 3
ROW 4
ROW 5
ROW 6
ROW 7
ROW 8
WHT-BRN
WHT-RED
WHT-ORN
WHT-YEL
WHT-GRN
WHT-BLU
WHT-VIO
WHT-GRY
2J12
2P12
FLIPPER GROUND
ORN-GRY
ORN-VIO
7SW72 LOWER RIGHT FLIPPER
8J3
8P3
PLAYFIELD FLIPPER COILS
BLU-VIO
BLK-YEL
BLU-GRY
BLK-BLU
7SW76 MEMORY PROTECT INTER
1J4
1P4
CPU BOARD
MEM PROT.
GROUND
ADVANCE
AUTO./ MAN.
BLK-RED
WHT
GRN
BLU
8J8
8P8
WHT-YEL
YEL
3J8
3P8
POWER 6.3 SUPPLY VAC
YEL
WHT-YEL
PLAYFIELD


R
7J2
7P2
3
4
6
8
9
10
11
12
13
14
15
1
2
7D15
7L15
BELL
7C1
0.1µF
7L15
7D16
7L16A
COIN
LOCKOUT
7D11
7L16B
7SW1
PLUMB
BOB
TILT
7D1
7SW2
BALL
ROLL
TILT
7D2
7SW3
CREDIT
BUTTON
7D3
7SW4
RIGHT
COIN
CHUTE
7D4
7SW5
CENTER
COIN
CHUTE
7D5
7SW6
LEFT
COIN
CHUTE
7D6
7SW7
SLAM
TILT
7D7
7SW8
HIGH
SCORE
RESET
7D8
7SW77
UPPER
LEFT
FLIPPER
7SW73
LOWER
LEFT
FLIPPER
RLOCK
7SW75
ADVANCE
AUTO-UP
7SW74
MANUAL-DOWN
GENERAL
ILLUMINATION

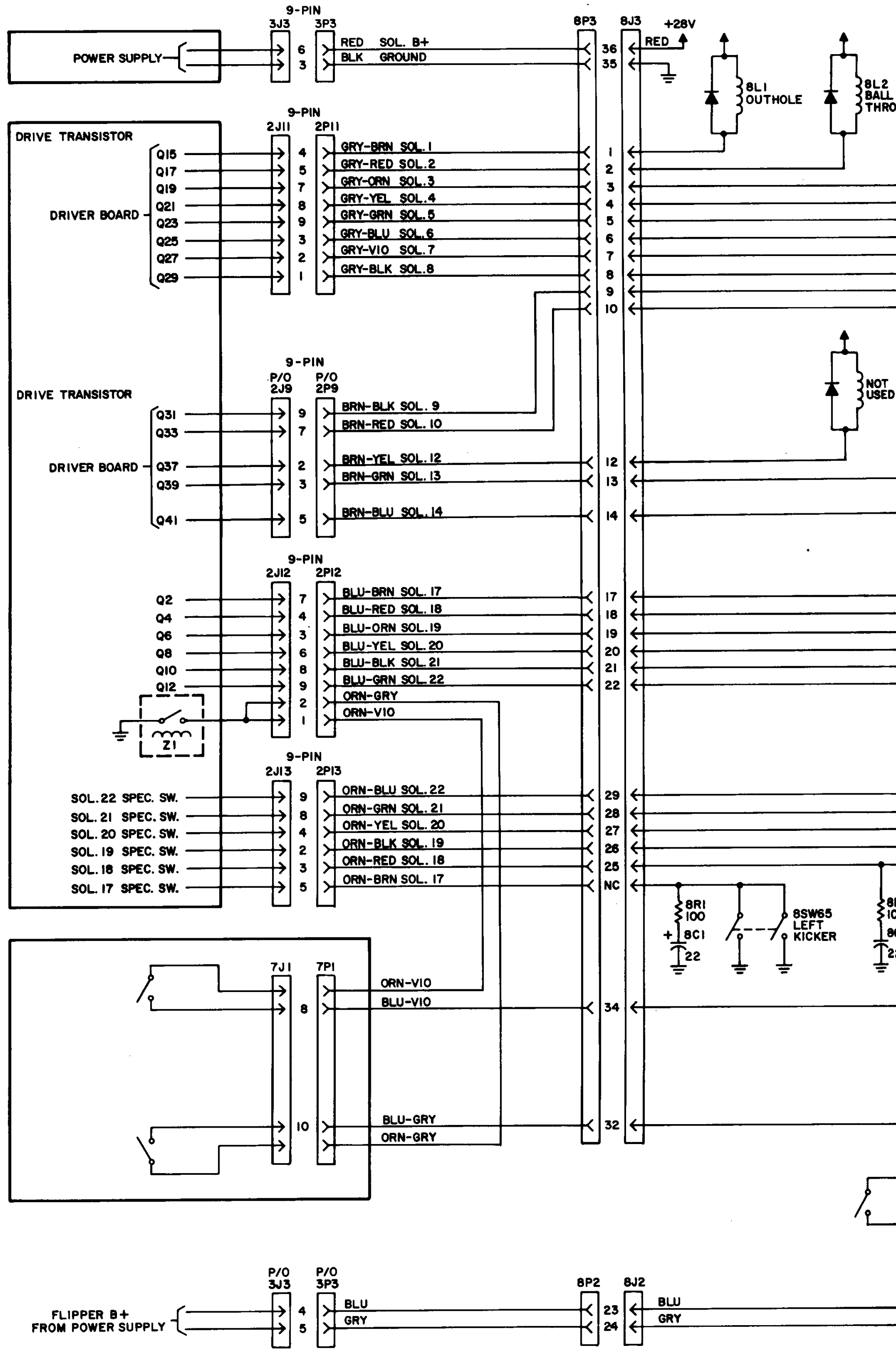


COL
2J5
2P5
8P2
8J2
PART OF DRIVER BOARD
YEL-GRY
YEL-VIO
YEL-BLU
YEL-GRN
YEL-BLK
YEL-ORN
YEL-RED
YEL-BRN
COLUMN 8
COLUMN 7
COLUMN 6
COLUMN 5
COLUMN 4
COLUMN 3
COLUMN 2
COLUMN 1
01 BACKBOX
02 BACKBOX
03 BACKBOX
04 BACKBOX
05 BACKBOX
06 BACKBOX
07 PLAYFIELD
08 PLAYFIELD
2J7
2P7
PART OF DRIVER BOARD
RED-BRN
RED-BLK
RED-ORN
RED-YEL
RED-GRN
RED-BLU
RED-VIO
RED-GRY
ROW 1
ROW 2
ROW 3
ROW 4
ROW 5
ROW 6
ROW 7
ROW 8
8J8
8P8
GENERAL ILLUMINATION
YEL
YEL-WHT
VIO
WHT
6.3 VAC GENERAL ILLUMINATION
* SEE INSERT BO

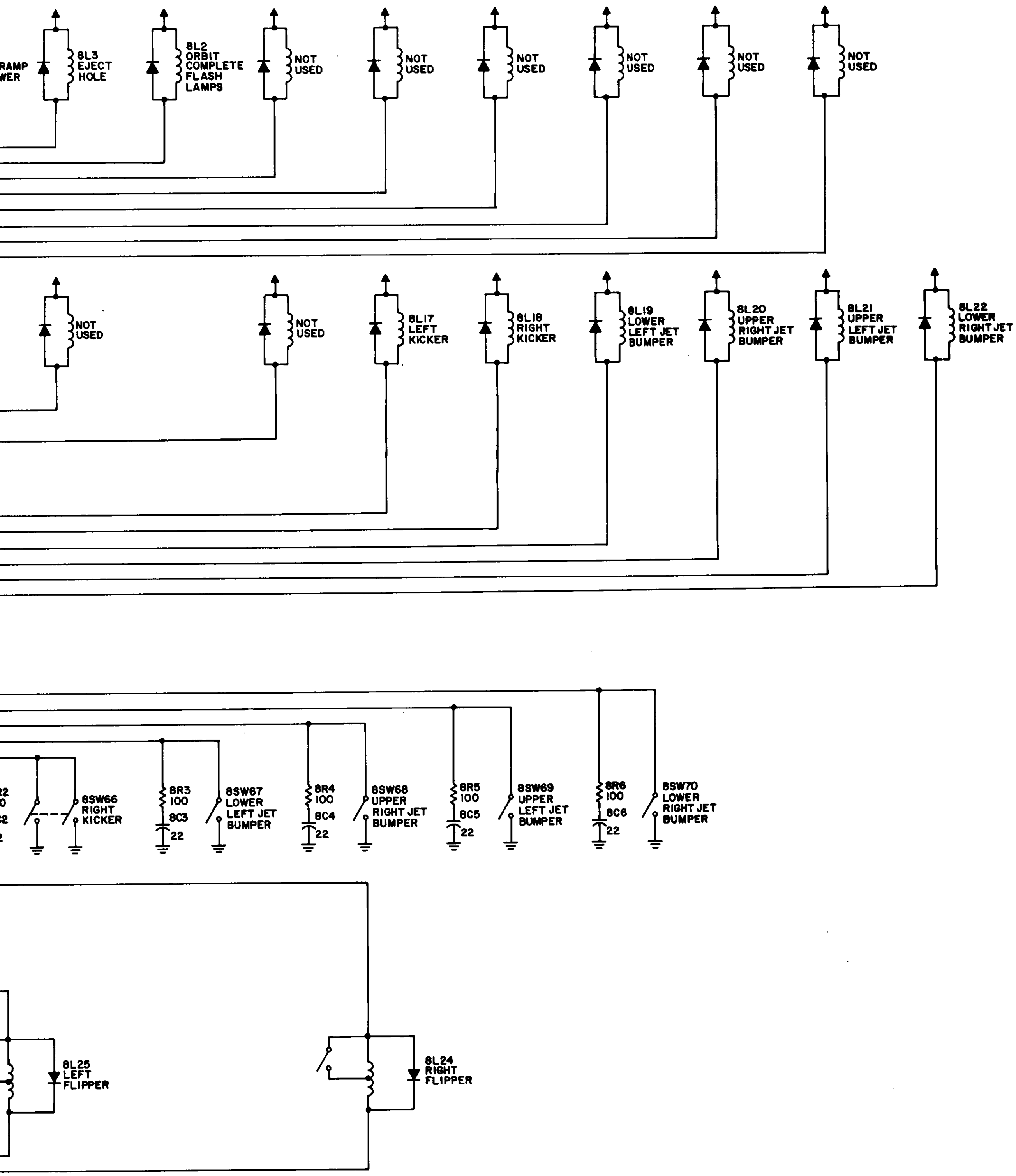


OARD WIRING DIAGRAM FOR CONNECTIONS FOR BACKBOX LAMPS.

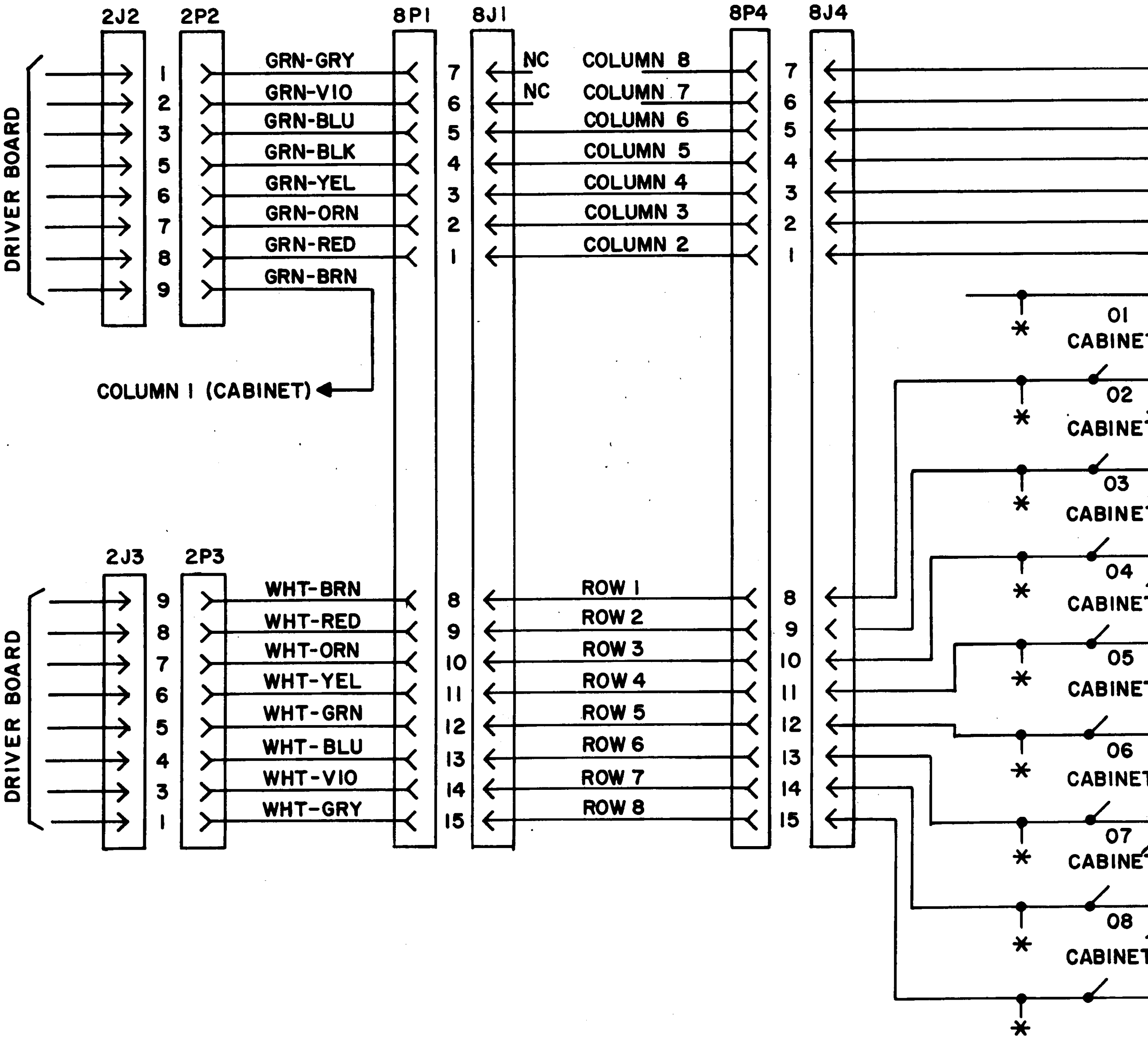
Lamp No.	Function	
1	Game Over	Backbox Lamps
2	Match	
3	Tilt	
4	High Score	
5	Shoot Again	
6	Shoot Again	
7	Double Score	
8	Bonus Holdover	
9	1,000 Bonus	
10	2,000 Bonus	
11	3,000 Bonus	
12	4,000 Bonus	
13	5,000 Bonus	
14	6,000 Bonus	
15	7,000 Bonus	
16	8,000 Bonus	
17	9,000 Bonus	
18	10,000 Bonus	
19	20,000 Bonus	
20	40,000 Bonus	
21	60,000 Bonus	
22	80,000 Bonus	
23	Bonus Holdover	
24	Fire Power Special	
25	"F"	
26	"I"	
27	"R"	
28	"E"	
29	"P"	
30	"O"	
31	"W"	
32	"E"	
33	"R"	
34	"A"	
35	"B"	
36	"C"	
37	"D"	
38	Left Drain Special	
39	Right Drain Special	
40	Ball in Play	
41	Lower Left Jet Bumper	
42	Upper Right Jet Bumper	
43	Upper Left Jet Bumper	
44	Lower Right Jet Bumper	
45	Left Flipper Return Lane	
46	Right Flipper Return Lane	
47	Mystery	
48	Extra Ball	
49	2x	
50	3x	
51	5x	
52	Eject Hole 10K	
53	Eject Hole 20K	
54	Eject Hole 50K	
55	Eject Hole Lock Arrow	
56	Release Target 50K	
57	Release Target 100K	
58	Release Target 150K	
59	Release Arrow	
60	Spinner	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

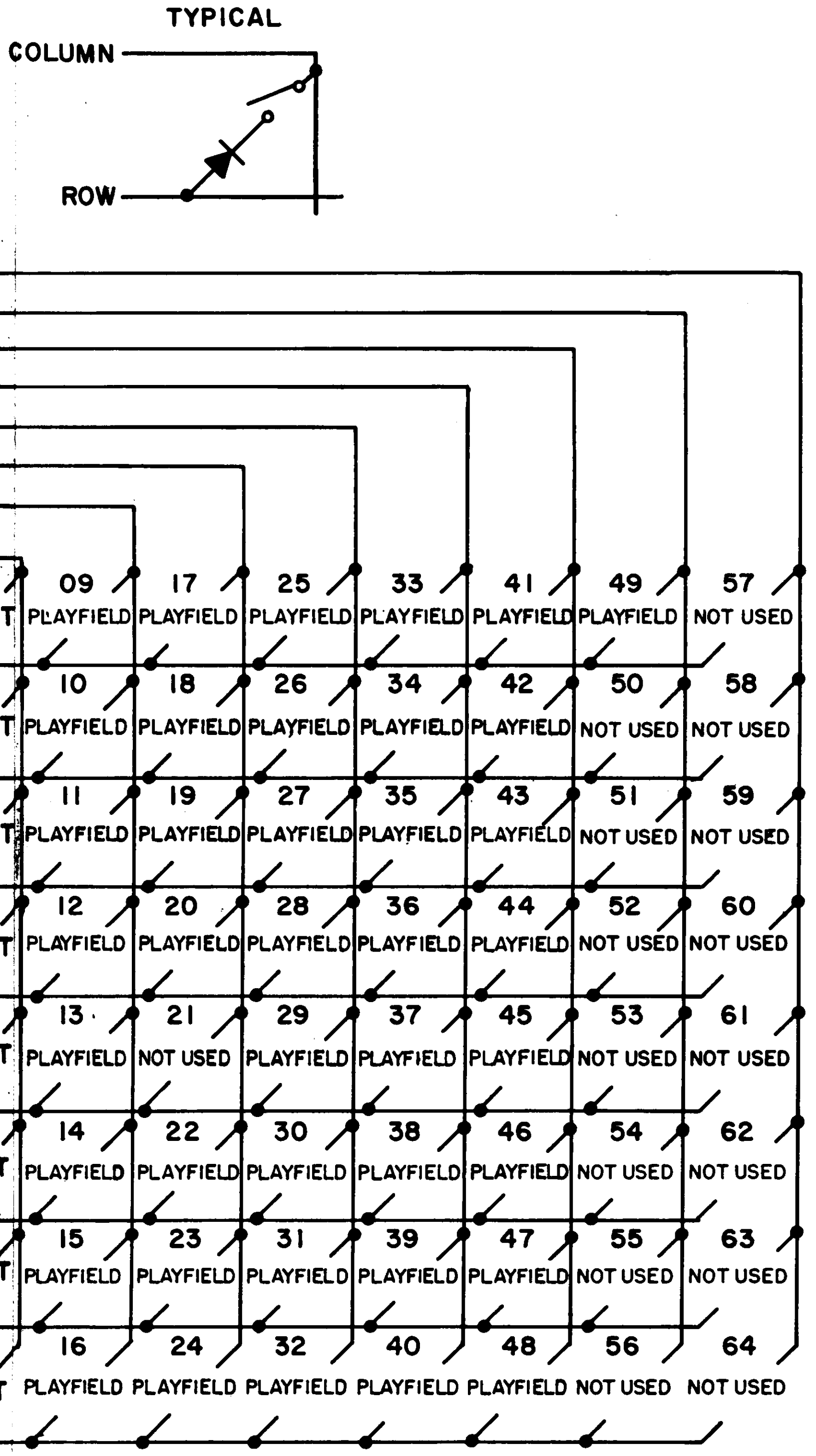


9-PIN
3J3
3P3
POWER SUPPLY
RED SOL. B+
BLK GROUND
8P3
8J3
+28V
RED
8L1 OUTHOLE
8L2 BALL THRO
DRIVE TRANSISTOR
DRIVER BOARD
2J11
2P11
Q15
Q17
Q19
Q21
Q23
Q25
Q27
Q29
GRY-BRN SOL. 1
GRY-RED SOL. 2
GRY-ORN SOL. 3
GRY-YEL SOL. 4
GRY-GRN SOL. 5
GRY-BLU SOL. 6
GRY-VIO SOL. 7
GRY-BLK SOL. 8
P/O 2J9
P/O 2P9
Q31
Q33
Q37
Q39
Q41
BRN-BLK SOL. 9
BRN-RED SOL. 10
BRN-YEL SOL. 12
BRN-GRN SOL. 13
BRN-BLU SOL. 14
NOT USED
2J12
2P12
Q2
Q4
Q6
Q8
Q10
Q12
Z1
BLU-BRN SOL. 17
BLU-RED SOL. 18
BLU-ORN SOL. 19
BLU-YEL SOL. 20
BLU-BLK SOL. 21
BLU-GRN SOL. 22
ORN-GRY
ORN-VIO
2J13
2P13
SOL. 22 SPEC. SW.
SOL. 21 SPEC. SW.
SOL. 20 SPEC. SW.
SOL. 19 SPEC. SW.
SOL. 18 SPEC. SW.
SOL. 17 SPEC. SW.
ORN-BLU SOL. 22
ORN-GRN SOL. 21
ORN-YEL SOL. 20
ORN-BLK SOL. 19
ORN-RED SOL. 18
ORN-BRN SOL. 17
NC
8R1 100
8C1 22
8SW65 LEFT KICKER
7J1
7P1
ORN-VIO
BLU-VIO
BLU-GRY
ORN-GRY
FLIPPER B+ FROM POWER SUPPLY
P/O 3J3
P/O 3P3
BLU
GRY
8P2
8J2
BLU
GRY



Solenoid Wiring Diagram


2J2
2P2
8P1
8J1
8P4
8J4
DRIVER BOARD
GRN-GRY
GRN-VIO
GRN-BLU
GRN-BLK
GRN-YEL
GRN-ORN
GRN-RED
GRN-BRN
NC
NC
COLUMN 8
COLUMN 7
COLUMN 6
COLUMN 5
COLUMN 4
COLUMN 3
COLUMN 2
COLUMN 1 (CABINET)
2J3
2P3
DRIVER BOARD
WHT-BRN
WHT-RED
WHT-ORN
WHT-YEL
WHT-GRN
WHT-BLU
WHT-VIO
WHT-GRY
ROW 1
ROW 2
ROW 3
ROW 4
ROW 5
ROW 6
ROW 7
ROW 8
01
CABINET
02
CABINET
03
CABINET
04
CABINET
05
CABINET
06
CABINET
07
CABINET
08
CABINET



Switch No.	Function	(Score)
1	Plumb Tilt	
2	Ball Roll Tilt	
3	Credit Button	
4	Right Coin	
5	Center Coin	
6	Left Coin	
7	Slam Tilt	
8	High Score Reset	
9	Outhole	
10	Right Ball Ramp	
11	Left Ball Ramp	
12	Ball Shooter Trough	
13	Lane Change	
14	Ramp in Roll Under	
15	Ramp out Roll Under	
16	Center Left Standup	(100)
17	Standup	(100)
18	Spinner	(100/1000)
19	Orbit in Roll Under	
20	Upper Left Standup	(50)
21	Not Used	
22	Upper Right Standup	(50)
23	Eject Hole	(5000/Lit Value)
24	Release Target	(1000)
25	"F" Target	(1000)
26	"I" Target	(1000)
27	"R" Target	(1000)
28	"E" Target	(1000)
29	"P" Target	(1000)
30	"O" Target	(1000)
31	"W" Target	(1000)
32	"E" Target	(1000)
33	"R" Target	(1000)
34	"A" Rollover	(1000)
35	"B" Rollover	(1000)
36	"C" Rollover	(1000)
37	"D" Rollover	(1000)
38	Left Outlane	(10,000)
39	Right Outlane	(10,000)
40	Orbit Out Gate	
41	Lower Left Jet Bumper	(100/1000)
42	Upper Right Jet Bumper	(100/1000)
43	Upper Left Jet Bumper	(100/1000)
44	Lower Right Jet Bumper	(100/1000)
45	Left Flipper Return Lane	(1000)
46	Right Flipper Return Lane	(1000)
47	Left Kicker	(10)
48	Right Kicker	(10)
49	Playfield Tilt	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	
54	Not Used	
55	Not Used	
56	Not Used	
57	Not Used	
58	Not Used	
59	Not Used	
60	Not Used	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

NOTE: Second value scored when lit

Playfield Switch Wiring Diagram

UNIQUE PARTS

PART NO.	DESCRIPTION
Backbox	
31-1146-521	Screened Backgalss
C-9939	Flipper Power Supply Board
Cabinet	
C-8500	Main Transformer Assembly
C-9905	Flipper Transformer Assembly
Playfield	
31-1006-521	Screened Playfield Plastics
C-9915-L	Left Flipper Assembly
C-9916-R	Right Flipper Assembly
D-9935	Ball Chute Entrance Ramp
12-6625	Ball Chute Guide Wire (Upper)
12-6626	Ball Chute Guide Wire (Lower)
B-9801	Curved Ball Gate Support Assembly
12-6628	Curved Ball Gate Wire Assembly
A-8046	Stationary Target Assembly (Square)
A-9920	Stationary Target Assembly w/Playfield Plastic Support
A-9268	Stationary Target Assembly
31-1166-521	Stationary Target Decal
B-9743	Screened Spinner Target